Construction Methods and Equipment

McGraw-Hill Publishing Company, Inc.

March, 1937

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...EL FRAME rises for ...tory building of Med... Center in Jersey City, ...J., a $7,500,000 im...rovement project to ...ce 600 patients, fi...anced by P.W.A.

Use INLAND PILING

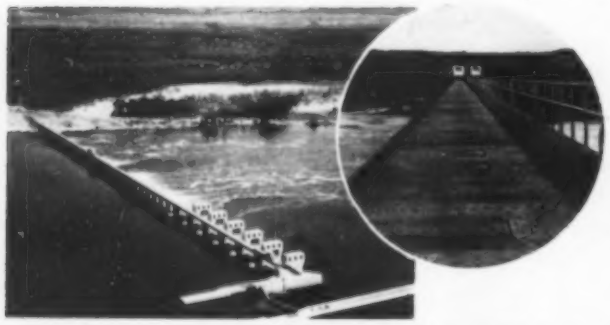
For many years Inland has been known as a large and successful producer of structural shapes. Among the principal products of Inland's structural mills is sheet piling.

Inland piling is designed to drive freely. It is properly proportioned to prevent bending or distortion during severe field service. Carbon and manganese are used to impart higher strength and toughness. The interlocks remain strong and tight under tension.

Experienced Inland engineers are always ready to give valuable service in the planning of piling jobs. A new catalog illustrates a number of recent installations. Write for it.

INLAND STEEL

Dam Floored with INLAND 4-Way Traffic Plate



Here's another of the many uses for Inland 4-Way Floor and Traffic Plate. On Dam No. 5 of the Upper Mississippi River, at Winona, Minn., it provides safe footing and a solid, long-lasting steel floor. For walkways, heavy-duty industrial floors, bridge treads and crossings, the exclusive 4-way pattern of Inland traffic plate provides extra stiffness and extra protection against slipping feet or skidding wheels. Write for our illustrated booklet which contains complete information.

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CURRENT JOBS

Construction
Methods and Equipment

ROBERT K. TOMLIN, Editor — MARCH, 1937 — WILLARD CHEVALIER, Vice-President

Editorial Staff: Vincent B. Smith, John B. Huttl (San Francisco), Paul Wooton (Washington), Nelle Fitzgerald

...and Who's Doing Them

Buildings

Public — At Los Angeles, Calif., **G. A. Fuller Co.**, Washington, D. C., will build fifteen-story post office and courthouse under $5,907,000 contract with U.S. Treasury Department. In Chicago, **Simpson Construction Co.**, Chicago, has received contract to erect $750,000 high school. In Troy, N. Y., foundation contract has been awarded to **J. J. Belotte & Sons**, Troy, for high school estimated to total $1,429,000. Substructure contract for courthouse addition, Boston, Mass., has been awarded to **Daniel Cunningham Construction Co., Inc.**, Boston, for $324,400. **John Griffith & Son**, Chicago, have received $1,022,000 contract for hospital addition, Ypsilanti, Mich. At Moose Lake, Minn., buildings for state hospital will be erected by **Standard Construction Co.**, Minneapolis, Minn., for $538,790. High school in Lebanon, Pa., estimated at $500,000, has been awarded to **Consolidated Engineering Co.**, Baltimore, Md. Two schools in Philadelphia, Pa., are to be built by **McCloskey Co.**, Philadelphia, for $432,000 each. At Charlottesville, Va., **Doyle & Russell**, Richmond, Va., will erect University of Virginia library building under $586,223 contract.

Industrial — At Martinez, Calif., additional cracking plants for Tidewater Associated Oil Co., estimated to cost $1,500,000, will be erected by **Alto Products Co.**, San Francisco. Plant at Newark, Calif., for California Chemical Co., estimated at about $1,000,000, has been put under contract with **H. K. Ferguson Co.**, Cleveland, Ohio, **P. J. Walker Co.**, San Francisco, Calif., will build $500,000 railway-bus depot, San Francisco, for Santa Fe Ry. Co. St. Joe Paper Co. has selected **James Stewart & Co., Inc.**, New York City, to build paper mill estimated to total $6,800,000 at Port St. Joe, Fla. **Stevens & Wood**, engineers, New York City, are in charge of building at Waterloo, Iowa, for Iowa Public Service Co., power house estimated at $1,000,000. A refinery at Trenton, Mich., for **Dixie Refining Co.**, estimated to exceed $1,000,000, will be built by **Arthur G. McKee & Co.**, Cleveland, Ohio. Plaudler Co., Rochester, N.Y., has awarded contract for plant estimated to cost $600,000 to **A. W. Hopeman & Sons Co.**, Rochester. At Dover and New Philadelphia, Ohio, Reeves Mfg. Co. awarded contract for two hot mill buildings, estimated at $500,000, to **Wendling Bros.**, Dover. Libbey-Owens-Ford Glass Co. awarded steam power plant and water intake, estimated $600,000, Rossford, Ohio, to **Stone & Webster Engineering Co.**, New York City. For refinery at Corpus Christi, Tex., **Barnsdall Oil & Refining Co.**, is awarding seperate contracts estimated $1,000,000. In Houston, Tex., American Can Co. awarded $1,250,000 contract for plant buildings to **J. E. Smith Corp.**, Houston. For carbon black plant at Sunray, Tex., estimated to total $1,250,000, **Witco Carbon Co.** has awarded and/or is awarding separate contracts including one for 500 tons structural steel to **Colorado Fuel & Iron Co.**, Pueblo, Colo.

Highways

State highway departments have awarded contracts as follows: Florida, grading 20 mi. Palm Beach County to **George D. Auchter Co.**, Jacksonville, Fla., $606,320 . . . Indiana, reinforced concrete paving of 7 mi. in Lake and Porter Counties to **T. McQueen**, Forest Park, Ill., $380,429 . . . Kansas, concrete paving 5.5 mi. to **J. A. Tobin Construction Co.**, Kansas City, Missouri, $296,534 . . . Oklahoma, concrete paving 6.8 mi. Ottawa County to **Standard Paving Co.**, Tulsa, Okla., $323,710 . . . Mississippi, concrete paving 15.4 mi. Jones and Jasper Counties to **Hardaway Contracting Co.**, Columbus, Ga., $304,783 . . . New York, improving 12.5 mi. Otsego County to **Warren Bros. Roads Co.**, Cambridge, Mass., $411,694; grading, structures, 5 mi., U. S. Military Reservation, Orange County, to **West Shore Concrete Co., Inc.**, Suffern, N. Y., $1,116,380; improving 0.71 mi. Otsego County, 5.3 mi. Sullivan County to **Lane Construction Co.**, Meriden, Conn. $204,423 and $433,330 respectively . . . Pennsylvania, reinforced-concrete paving, widening two concrete bridges and relaying brick on 2.6 mi. in Tarentum, Allegheny County, to **General Asphalt Paving Co.**, Canton, Ohio, $347,829 . . . Texas, concrete paving 15.5 mi. Montague County to **Standard Paving Co.**, Fort Worth, Tex., $327,545; grading and paving 13.3 mi. Jefferson County to **Russ Mitchell, Inc.**, Houston, Tex., $299,299.

Bridges

At Chicago, Ill., reinforced-concrete and other work for Outer Drive bascule bridge was awarded to **W. E. O'Neill Construction Co.**, Chicago, $954,888; grade separation, to **N. S. Mackie Co.**, Chicago, $492,769. Contract for substructure, approaches and erection of steel in altering and extending combination railway-highway bridge at Simmesport, La., was awarded by Louisiana & Arkansas R.R. to **Massman Construction Co.**, Kansas City, Mo., $743,355. Low bids for bridge across Eggemoggin Reach between Deer Isle and Sedgwick, Me., were received from **Frederick Snare Corp.**, New York City, substructure, $517,900, and **Phoenix Bridge Co.**, New York City, superstructure, $318,624. Bridges on Oakland Ave. extension, St. Louis, Mo., were awarded to **Chase Construction Co.**, St. Louis, $295,522. Substructure of bridge crossing Missouri River between Atchison, Kan., and Buchanan County, Mo., was awarded to **Kansas City Bridge Co.**, Kansas City, Mo., and **Missouri Valley Bridge Co.**, Leavenworth, Kan., $294,275; superstructure to **Wisconsin Bridge & Iron Works**, Milwaukee, Wis., $304,826. At Manchester, N.H., portion of bridge substructure and superstructure to **J. F. Fitzgerald Construction Co.**, Boston, Mass., $233,000; main steel arch span to **American Bridge Co.**, Boston, $166,178. In Bronx County, N.Y., **Garofano Construction Co., Inc.**, Mount Vernon, N.Y., will complete grade separation under contract for $543,701. Multiple deck girder bridge, Queens County, N.Y., was awarded to **C. F. Vachris, Inc.**, Brooklyn, $449,994. In Cuyahoga Co., Ohio, stone-faced hollow spandrel reinforced-concrete arch bridge was awarded to **J. C. Fisher**, Cleveland, $350,068. Two contracts for bridge across Albemarle Sound, Washington and Chowan Counties, N.C., went to **T. A. Loving & Co.**, Goldsboro, N.C., $587,773 and to **Tidewater Construction Corp.**, Norfolk, Va., $687,459.

Waterworks

Contract to build 7-mi. water tunnel for Baltimore, Md., was awarded to **J. F. Shea Co., Inc.**, Los Angeles, Calif., $5,389,312. New York City has awarded two contracts for tunnel shafts to **Dravo Corp.**, Pittsburgh, Pa., $1,738,250 and $4,108,583.

Sewers

Newport Beach, Calif., has awarded $327,743 contract for sewerage system to **Drainage Construction Co.**, Little Rock, Ark. **Engstron & Wynn**, Wheeling, W.Va., will build disposal plant at Atlanta, Ga., under $304,300 contract. Sanitary District of Chicago, Ill., has awarded contract for treatment works to **E. J. Albrecht Co.**, Chicago, $775,837; sewer contract to **Herlihy-Mid Continent Co.**, Chicago, $621,160.

Miscellaneous

Mississippi River dams were awarded as follows: Dam 3, Red Wing, Minn., to **A. Guthrie & Co.**, St. Paul, Minn., $1,293,298 . . . Dam 13, 4½ mi. above Clinton, Ia., to **McCarthy Improvement Co.**, Davenport, Ia., $2,384,289 . . . Dam 17, 4 mi. above New Boston, Ill., to **Maxon Construction Co., Inc.**, Dayton, Ohio, $2,281,403. **Missouri-Kansas-Texas R.R.**, St. Louis, Mo., plans to spend $5,000,000 relaying 100 mi. track. In Flushing, N.Y., **Rodgers & Haggerty, Inc.**, New York City, will build tide gate and dam on Flushing River, $586,361. Also in New York City, second (north) tube of Midtown Hudson Tunnel was placed under general contract with **Mason & Hanger**, New York, $8,764,003, and section of 6th Ave. subway was awarded to **A. A. Johnson & Necaro Co., Inc.**, Long Island City, N.Y., $4,715,864.

The "How" of it:

(For the benefit of readers concerned with the practical application of method or equipment the following references are to articles or illustrations in this issue that tell:)

CURRENT JOBS

...and Who's Doing Them

CONSTRUCTION *and Open Bidding*

DURING the late depression our economic system has come in for some pretty close scrutiny. To be sure, all of it has not been well-informed or unbiased. Much of it has been born of fear, prejudice, resentment or some other emotion inspired by a short-term view of self interest. But as we swing into recovery there emerges from this confusion of counsel agreement on certain basic ideas. Now that their concern over self preservation becomes less desperate, people are beginning to see more clearly and to appraise more justly.

One of these reestablished fundamentals is the importance of competition. Always this principle has received universal lip service; frequently, however, it has been trampled under foot when panic has seized upon those who normally profess it. A striking case in point was the NRA uproar of 1933. Through that agency many attempts were made to reduce competition to the lowest practicable degree and thereby to secure established interests and enterprises regardless of the all-important consumer and of our economy as a whole.

TODAY reaction from this attitude is widespread and wholesome. One need not labor the point with many citations. One will suffice. It is from a recent statement before the Senate Finance Committee by Lewis W. Douglas, who surely is free from any taint of prejudice against American industry.

Mr. Douglas said, "Price fixing and restrictions on production imposed for the purpose of maintaining or elevating a price structure have the effect of limiting the amount of goods which can be purchased by the consuming public. Thus these practices retard the production of more goods at lower prices and thus they prevent, on the one hand, an automatic distribution of wealth and give rise, on the other, to artificial methods of accomplishing this purpose."

In other words, the suppression of competition throttles the natural productivity of our system and invites governmental interference with free enterprise.

All this is for the purpose of emphasizing that construction is one of the basic services that are kept available on a competitive basis. It is one of the industries that stick most closely to the elementary principle on which our whole system is based.

Competitive bidding is well established in construction practice. The industry consists of a very large number of small producers. Each separate job must be bid on its merits. Even though attempts to restrict competition may occasionally succeed, it is true, for the most part, that the small size of the jobs, their distinctive character and the large number of prospective bidders all conspire to make any price-fixing device untrustworthy and disappointing to the constructor.

ANOTHER factor that makes for this is the construction buyer's practice of looking at price alone. Many industry evils arise from this. So far from achieving any success in fixing prices, the constructors would be happy to reach a stage at which their customers would measure prices against comparable values. It is this practice of concentrating on price and ignoring value that has nourished the "irresponsible bidder," admitted by most students of the industry to be its besetting evil. It was to combat that evil that the industry cooperated to establish the Bureau of Contract Information, probably the first practical effort to help construction buyers rate bidders on the basis of merit in performance.

Every so often someone hatches a scheme for constructors to "stabilize" the price of their services. But if they are wise, they will shun all such attempts. Harassing as it may be to carry on under the reckless competition that frequently plays havoc with prices, they will do better to stick to the principle that has done so much to develop the initiative and technical progress of construction. The amazing proficiency of the American constructor and the noteworthy roll of his achievements are due in no small part to the pressure of this competitive effort.

Construction should attack the evils that result from irresponsible and unfair competition not by seeking to suppress competition but by teaching the buyer of construction service to appraise more justly the value of what is offered to him. Such a course is wholly in keeping with the standing of construction as one of the most characteristic American industries.

Willard Chevalier

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THE PLUMBERS DIDN'T HAVE THE CONTRACTOR

"ON THEIR NECKS"

FOUR-STORY concrete-frame dormitory for John Tarleton College, Stephenville, Texas—Preston M. Geren, Ft. Worth, architect—was built with 'Incor' 24-Hour Cement. Schedule, one floor a week, with one set of forms. Temperatures ranged from 75 to 40 degrees, but all forms and shores were stripped in 2 days, except one floor, held 3 days. Photograph below, pouring 3rd floor. Lone Star Cement was used in roof slab.

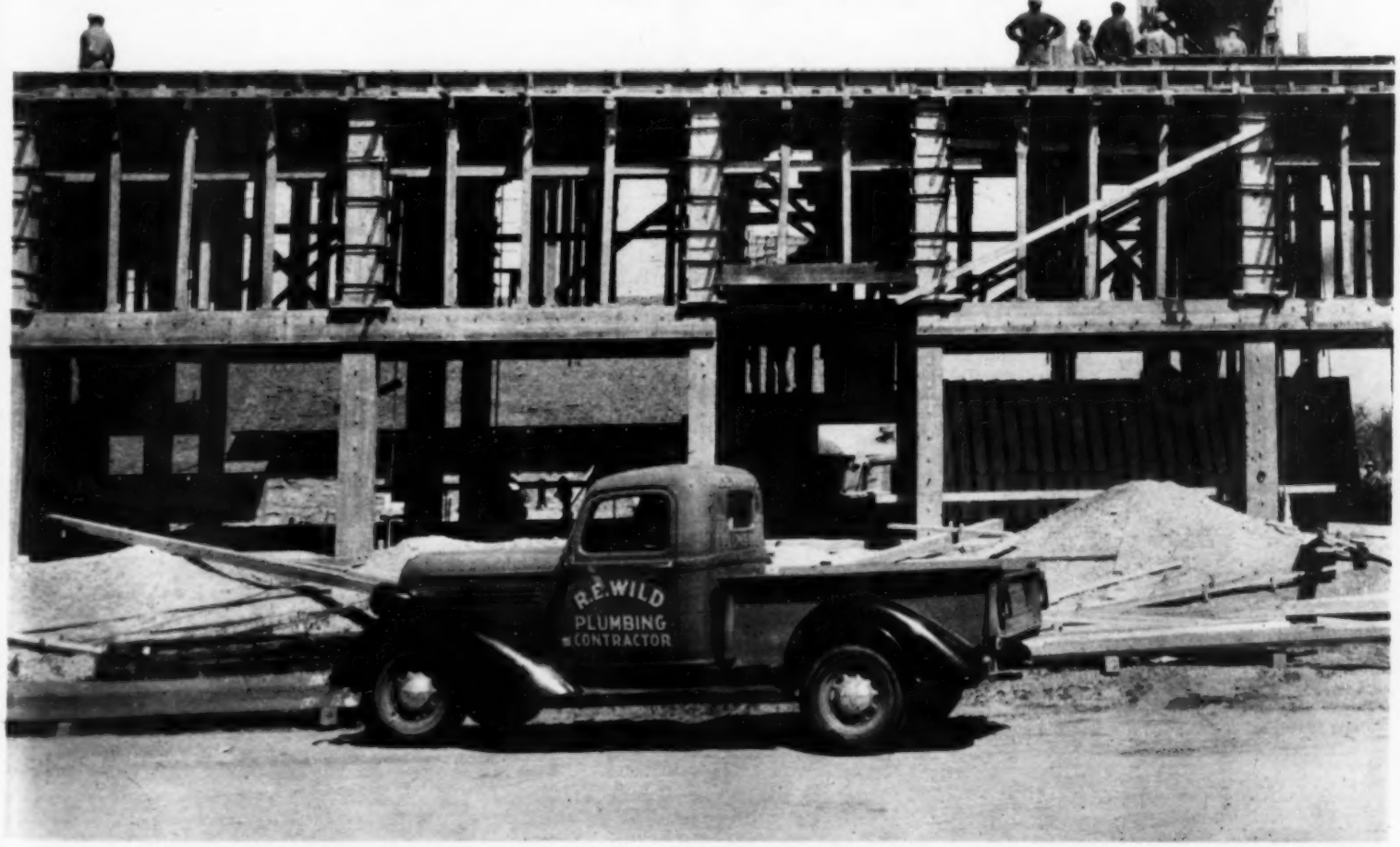
Henger Construction Co., Dallas, contractor, estimates form-material saving of 10,000 f.b.m., $25 per thousand, $250. Time saved, 15 days—superintendence and overhead, $15 a day—meant a second saving of $225.

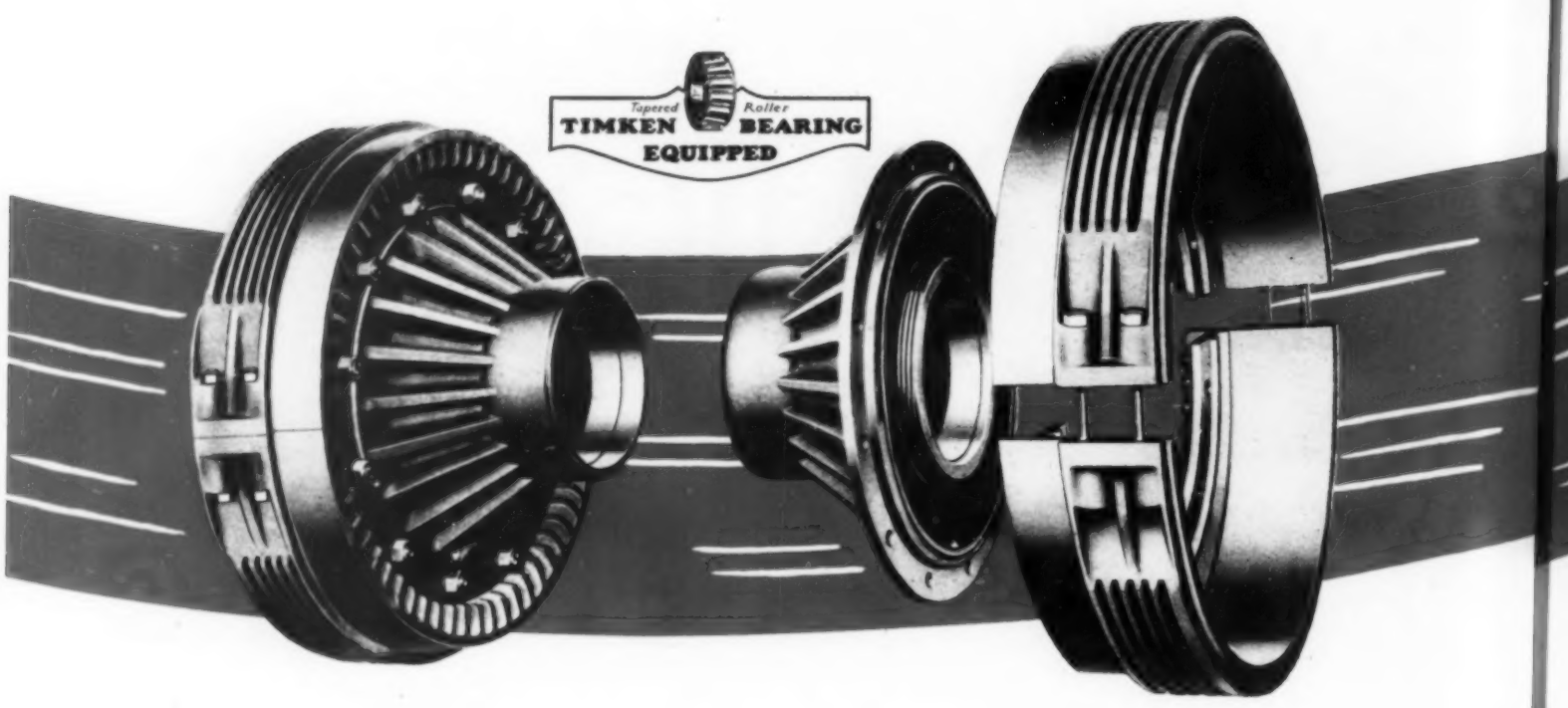
And plumbers were on the job two weeks sooner, following right behind general contractor on all floors. Instead of having the contractor "on their necks," as is usually the case, plumbers were out of the way when general contractor was ready to start other work. Smoother operation all along the line means an added saving with 'Incor'—and it's well worth reckoning, too.

It pays to work out an erection schedule that makes the best use of time—one in which the total cost of labor, materials and time are reduced to a minimum. Then, use 'Incor'* if it shows you a profit—and it usually does; otherwise, use Lone Star Cement. You gain either way, because better cement makes better concrete. Lone Star Cement Corporation, New York. Sales offices in principal cities.

*Reg. U. S. Pat. Off.

'INCOR' 24-HOUR CEMENT





THE big yardages moved at high-speeds by a 1½ yd. Lorain-77 mean it will often make 1,000 or more passes a day, or over 2,000 swing motions—And the L-77 is built with a swing mechanism to take such continuous, high-speed punishment . . . Swing drums are mounted on Timken Roller Bearings; Bevel Pinions are of heat-treated molybdenum manganese steel for extra long life; Clutch Friction Rings are separate pieces of nickel cast iron, best suited to long lining life; Friction Rings are in two sections for easy, economical removal; Swing Clutches are booster-operated for easy manipulation; Swing Clutch Bands are of the reversible type which, after normal initial wear, can be turned end for end, to yield again as much, and often times twice as much, additional service.

THE THEW SHOVEL CO. • LORAIN, OHIO

THEW CENTER DRIVE

LORAINS

MOVE MORE MATERIAL, FASTER AT LOWER COST

CU. 3/8 to 2 YD.

SWING IT

Don't be held up

Wire rope and gear teeth need a lubricant that will not throw off at speed or wash off in rainy weather. Texaco Crater is the perfect answer to this problem.

WHEN the derricks and shovels stop, a job settles down to "slow motion."

Your equipment needn't stop because of wire rope trouble when your rope is lubricated regularly with Texaco CRATER.

Crater coats each individual wire with a tough, viscous film that is weather-proof, rust-proof, water-proof. Lasts several times longer . . . makes your wire ropes last longer, too.

Ordinary wire rope lubricants are costly to use because they throw off when run over the small sheaves in service at high speed.

Crater costs you less to use because it *clings*.

FOR GEAR TEETH. Crater quiets gears immediately. Stops excessive noise. Reduces *wear*.

A Texaco representative will gladly provide practical engineering service to prove the economies of Texaco Products.

THE TEXAS COMPANY · 135 E. 42nd St., N. Y. C.
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FREE TO ALL. 32-page booklet. Where to use Crater and how to apply it to wire rope and gears. Dozens of ideas for the practical man.

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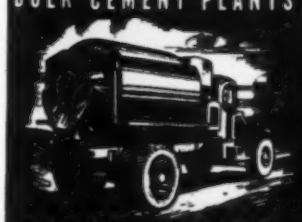

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ROAD FINISHERS

CLAMSHELL BUCKETS

also WEIGHING BATCHERS for Aggregates and Cement ... CENTRAL MIXING PLANTS ... TRUCK MIXER LOADING PLANTS ... STEEL FORMS for General Concrete Construction ... CONCRETE BUCKETS ... BOTTOMLESS SCRAPERS ... SHEEPSFOOT TAMPING ROLLERS

The Self-Aligning feature alone makes this new Blaw-Knox ROAD FORM a good buy for any Contractor

- This new design of Road Form, which has been thoroughly proved in service, permits rapid form setting, always true to line and grade regardless of whether the steel stakes become bent or forced off plumb in stony ground.

Blaw-Knox Bulletin No. 1557 will show you how the improved design of buttress braces makes this new Road Form inherently stronger and more durable to take the shocks of modern paving operations. *Send for your copy.*

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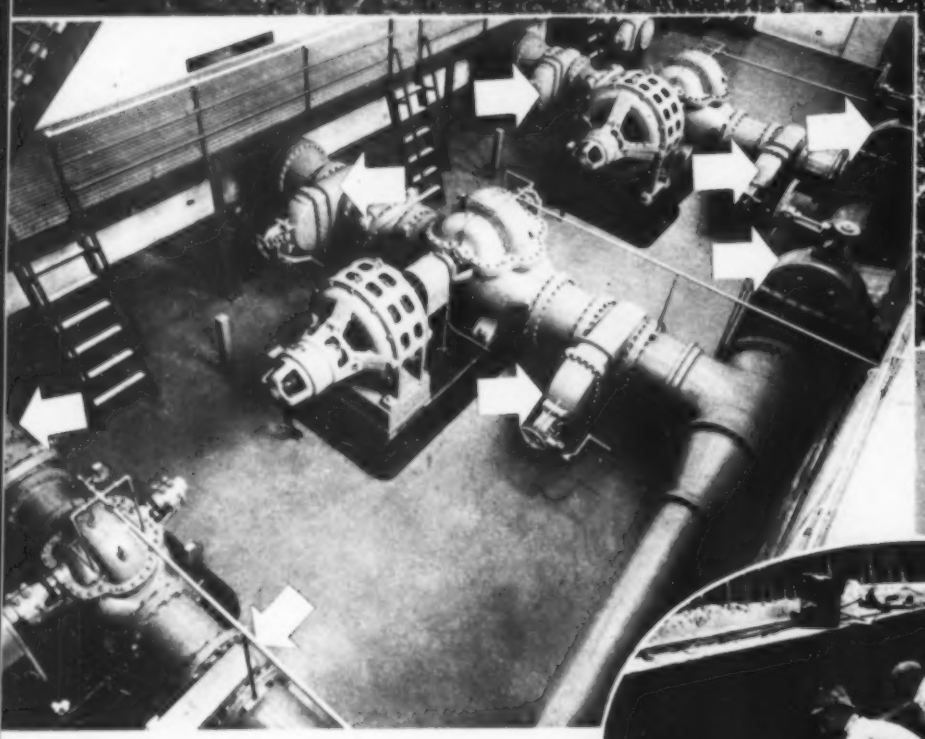
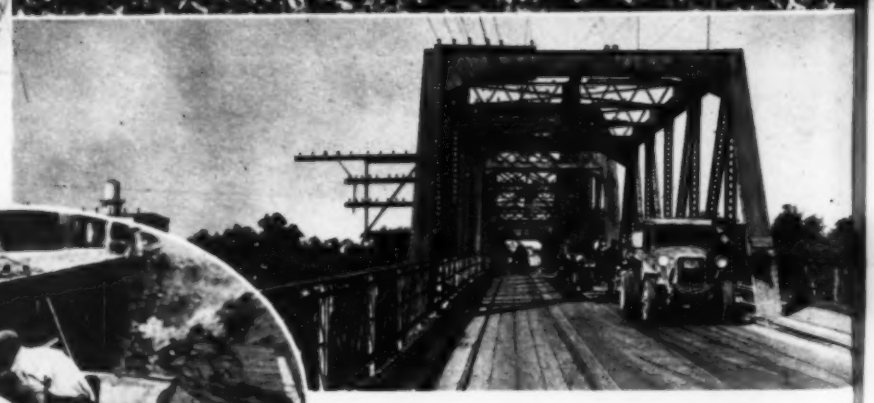
serves



THESE "WESTERN" VALVES (BOTH VERTICAL AND HORIZONTAL) HAVE THE SAME TYPE OF DISCS—This photograph shows WESTERN Valves in the filtration plant of the City of Hammond, Ind. Western Valves are installed in a horizontal as well as vertical position. Yet all have the same design bodies, dics and wedging mechanism. The discs are suspended at their centers which allows free rotation in opening and closing, and eliminates the need for rollers, scrapers and tracks for the discs when the valve is installed in a horizontal position.

THIS BRIDGE IS PROTECTED WITH KOPPERS MEMBRANE WATERPROOFING—The use of Koppers Membrane Waterproofing on bridges prevents the passage of water through the floor, and thus protects the concrete or masonry from disintegration.



CREOSOTED WOOD (FROM THE WOOD PRESERVING CORPORATION) WAS USED ON THIS BRIDGE FLOOR—The Monongahela-West Penn Bridge over the Little Kanawha River at Parkersburg, W. Va. has a floor of creosoted black gum. The wood was seasoned by the Boulton Process and pressure treated by the empty cell process with creosote to a retention of 8 lbs. of creosote oil per cubic foot of wood. All the wood was cut to exact lengths before treatment. The Wood Preserving Corporation, a Koppers subsidiary, also treats poles, piling, guard rails, guard rail posts, ties, cross arms, crossing planks, and cribbing with creosote or salt preservatives.

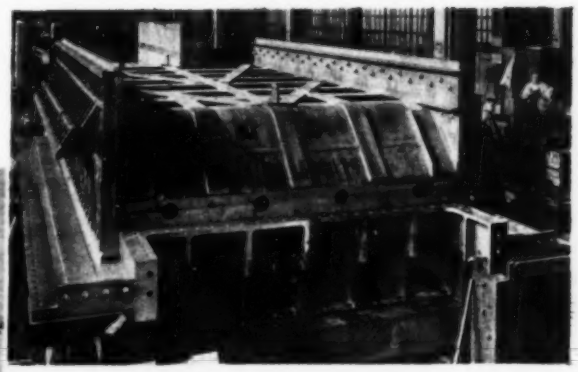
KOPPERS COMPANY DESIGNERS . . BUILDERS . . PRODUCERS . . MANUFACTURERS . . DISTRIBUTORS

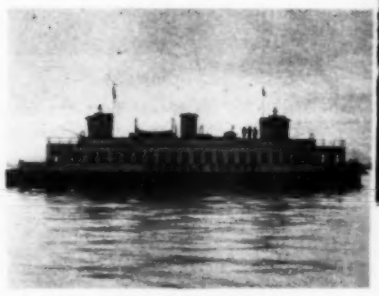
KOPPERS

...es the public works field...

THESE CREOSOTED POSTS ARE PAINTED WITH LUMINO—Lumino is a bituminous base paint containing Alcoa Albron Aluminum Powder. As it is applied, the tiny flakes of aluminum "leaf" to the surface, forming an overlapping metal protection. The bituminous vehicle forms a strong bond between the creosoted surface and the aluminum metallic film. The aluminum gives a bright, highly-visible and attractive appearance to creosoted guard rails, posts, wheel guards and other timber. Koppers also handles a complete line of paints, for metal and for wood, including waterproofing and decorative paints.

KOPPERS TARMAC BEING USED IN MIXED-IN-PLACE CONSTRUCTION IN PENNSYLVANIA—In Mixed-in-place Construction (coarse aggregate type) hot-application Tarmac (having a float test of 60 to 150 or 150 to 210 seconds at 32° C.) is gradually supplanting the use of heavy cold-application tars for warm-weather use. By applying the hot Tarmac in one application rather than two, the mixing cost is reduced one third without sacrificing thorough mixing. The use of hot Tarmac gives a surface with greater initial stability and permits quicker application of the seal coats. For work in cool weather, heavy cold-application Tarmac is preferred. (Photo shows wedge course of slag and Tarmac being bladed over primed concrete surface)





THE MARYLAND DRYDOCK COMPANY BUILT THIS FERRY—The automobile ferry Norfolk County, built for the Norfolk County Ferries and operating between Norfolk and Portsmouth, Va., was built by The Maryland Drydock Company, at Baltimore.

BARTLETT HAYWARD DIVISION, BALTIMORE, DEVELOPS KOPPERS D-H-S BRONZE AND, FOR THE FIRST TIME, BRONZE IS USED IN TUNNEL LININGS—This photograph shows one of the tractor gates (partially assembled) for the Emergency Gate Shafts at the Fort Peck Dam. On this project there is to be used 350,000 lbs. of D-H-S Bronze and 1,200,000 lbs. of B. H. Manganese Bronze Castings. D-H-S Bronze combines the highest Ductility, Hardness and Ultimate Tensile Strength.

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HILER ENGINEERING AND CONSTRUCTION COMPANY, INC. — PITTSBURGH, PA.
AMERICAN HAMMERED PISTON RING DIVISION — BALTIMORE, MD.
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THE MARYLAND DRYDOCK COMPANY — BALTIMORE, MD.
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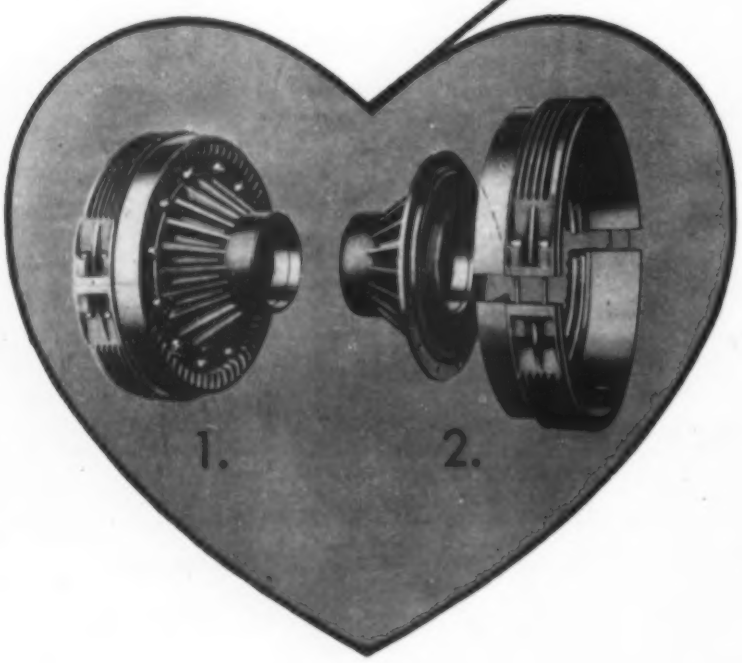
NAME.....

ADDRESS.....

.....

THIS "LORAIN" POWER SHOVEL *has a* HUSKY HEART

● *The very "heart" of the power shovel is the swing clutch friction drums, which often swing the 80,000 lb. unit as much as 2000 times a day, requiring as much as 4,000 engagements of the clutch with these friction drums.*



The Swing Clutch Friction Drums are

NICKEL CAST IRON

To STAND the severe day-by-day stress the shovel takes as a matter of course... you'll do well to give this "heart" an ample reserve of strength.

Judging by the way "Lorain" shovels keep the dirt flying steadily...it pays anyone who needs this margin of strength to consider carefully the choice of materials of their maker, Thew Shovel Company, Lorain, Ohio. Particularly since strength and wear resistance in the friction drum must be combined with a homogeneous structure which permits rapid cooling. For years Lorain has made the friction rings of these drums of a cast iron alloyed with Nickel.

• • •

The swing drum assembly shown here is made by Lorain Castings Co., a subsidiary of Thew Shovel Co. Fig. 1 shows the drum completely assembled; in Fig. 2 you may see the clutch friction ring of Nickel Cast Iron, cast in two pieces. This is shown detached from the swing bevel. The fins to dissipate heat, and the thin sections necessitate a metal with good casting properties.

The alloy here used has a maximum carbon content of 2.75%, with Nickel 1% and upwards. Tensile strength is 55,000 lbs. p.s.i. In addition, the uniform gray structure prevents galling, assures exceptional long life to the brake lining it touches.

Consultation to determine the most suitable Nickel Alloy composition and treatment for *your* specific job is invited.

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

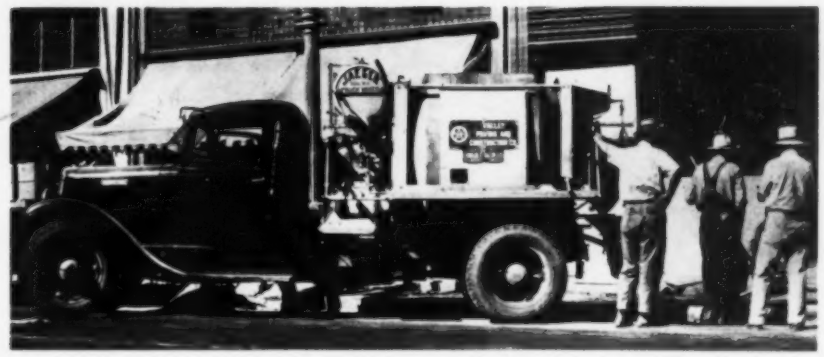
pany, at Baltimore.

Strength.

Build It With JAEGER Truck Mixed Concrete

- HIGHER STRENGTH, Greater Workability, and No Segregation in the Material,
- Lower First Cost and Big Job Savings to the Contractor Due to Mobile Operation.

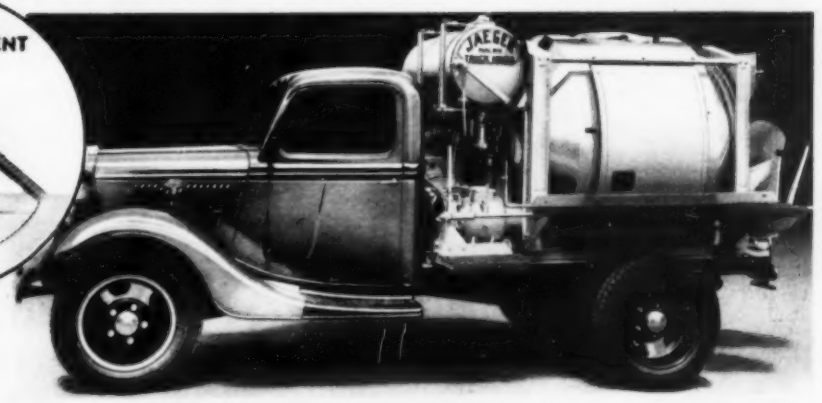
Whether you produce your own material or buy it ready-mixed, it pays to build with Jaeger Truck-Mixed Concrete. For any job, big or small, Jaeger Truck Mixers provide a recognized higher strength, more workable concrete, and place it at savings no contractor can afford to pass up. For paving and special jobs Jaeger Truck Mixers are the lowest cost portable or stationary plant a contractor can buy.



While 3 contractors were using 38 big 4-yard Jaegers on the Los Angeles Aqueduct, Valley Paving & Construction Co., at Fresno, Calif., were pouring this sidewalk with a 1½ yd. Jaeger. Fast, flexible, mobile operation with Jaegers makes money on small jobs as well as big.

A. E. Murphy, contractor on the grade operation of U. S. 24 and the Pere Marquette R. R. north of Plymouth, Mich., put in the curbing and extensions with Jaeger Truck Mixed Concrete—a typical fast moving job done with a small crew. PAVING, SEWER, GENERAL CONTRACTORS, write today for Prices and Latest Catalog.

THE JAEGER MACHINE CO., 800 Dublin Ave., Columbus, Ohio



Jaeger 1½ Yd. High Speed Unit on Short Wheelbase Ford. Other sizes 1, 2, 3, 4, 5 cu. yds., end or side discharge types.

Mid-South Cotton Growers Association Building, Memphis, Tenn. S. & W. Construction Co., builders. Walk C. Jones and Walk C. Jones, Jr., architects. Gardner & Howe, engineers.

Yes, it was formed in Concrete... are you up on this modern way of building?

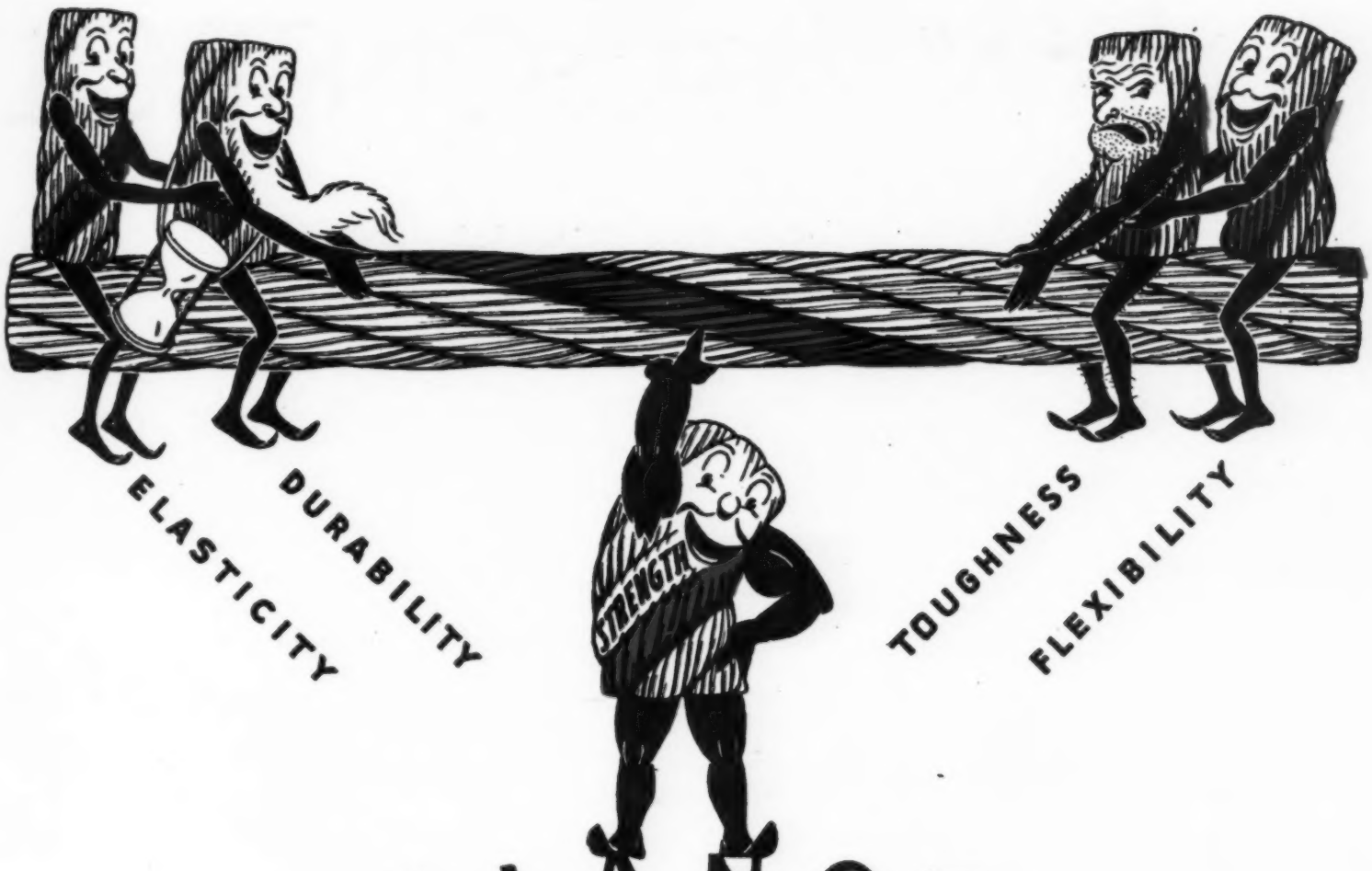
If you are, you're in position to cash in on the ever-growing trend toward concrete.

All over the country, owners and architects of hundreds of new factories, offices, hospitals, hotels, schools, theaters and churches are turning to concrete as the means of achieving architectural distinction with economy of first cost and maintenance. Walls, floors, frame and ornament are cast as a monolith in one economical material.

It will pay you to know how to design and erect forms properly, control concrete quality and meet other requirements of the jobs coming up in your locality.

Check the coupon and attach to your letterhead for facts on latest developments in this technique.

PORTLAND CEMENT ASSOCIATION
Dept. 3-16, 33 W. Grand Ave., Chicago, Ill.
Please send literature checked: ( ) "Forms for Architectural Concrete."
( ) Information Sheets on specifications and other details (AC series 1 to 18).
Name ..... Company .....
Address .....
City ..... State .....



BALANCED

Contractors everywhere know from past experiences that a wire rope to "stand the gaff" on the tough jobs of today must be endowed with a number of vital qualities—just strength alone is not sufficient; furthermore, all of these qualities must be in perfect balance.

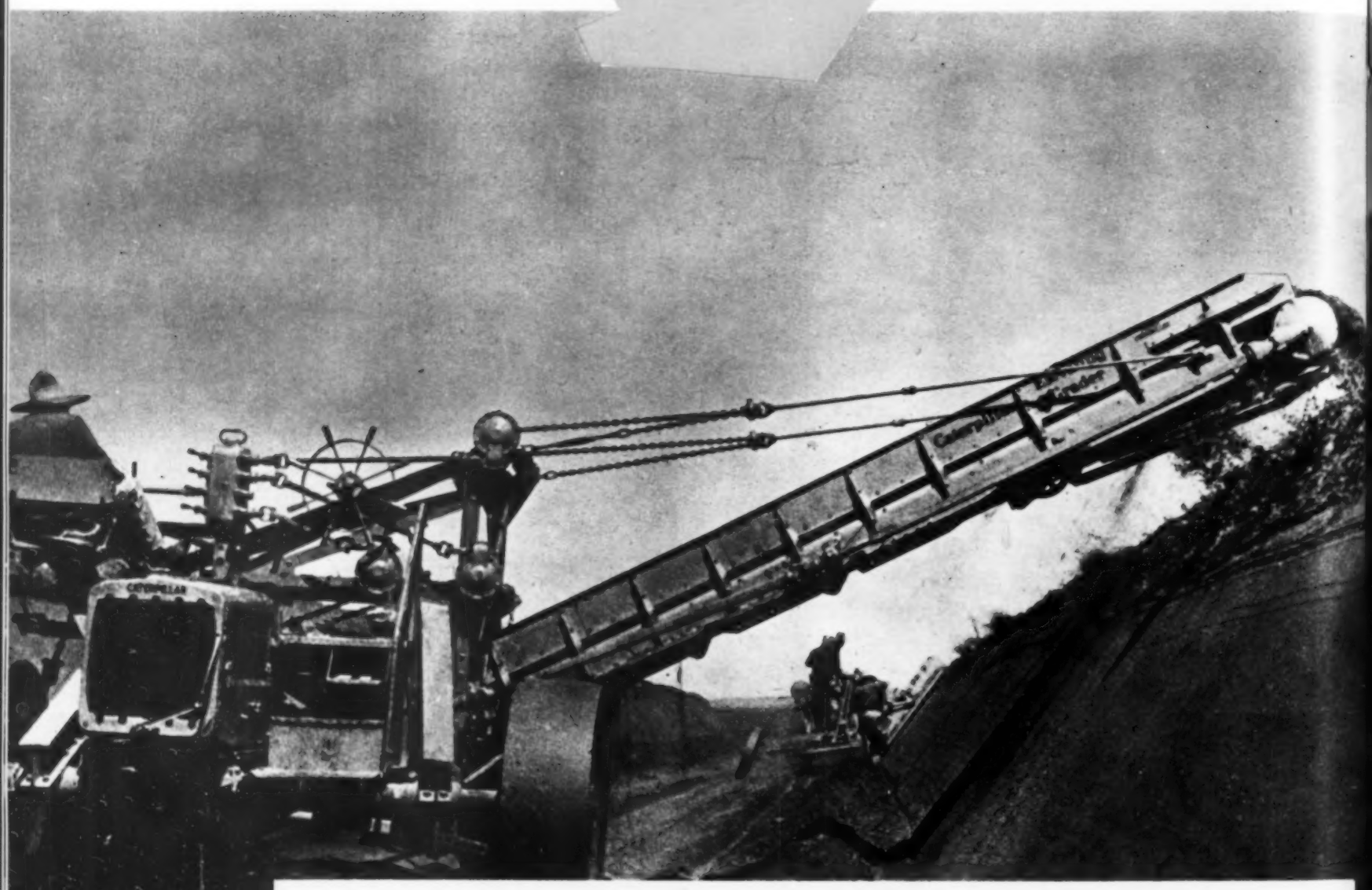
And this is another reason why "HERCULES" (Red-Strand) Wire Rope is so *consistently* dependable and long lasting. Our 80 years of rope making experience has enabled us to know what is needed to make a properly balanced wire rope, as well as how to produce it. Why not give this time tested rope a chance to prove what it can do for you?

Made Only by **A. Leschen & Sons Rope Co.** *Established 1857*

5909 Kennerly Avenue, St. Louis, Mo.

New York.....90 West Street
Chicago.810 W. Washington Blvd.
Denver.....1554 Wazee Street
San Francisco..520 Fourth Street
Portland..914 N. W. 14th Avenue
Seattle...2244 First Avenue South

ACCURATE CONTROL



▲

½-INCH TOLERANCE ON SOUTH AFRICAN CANAL

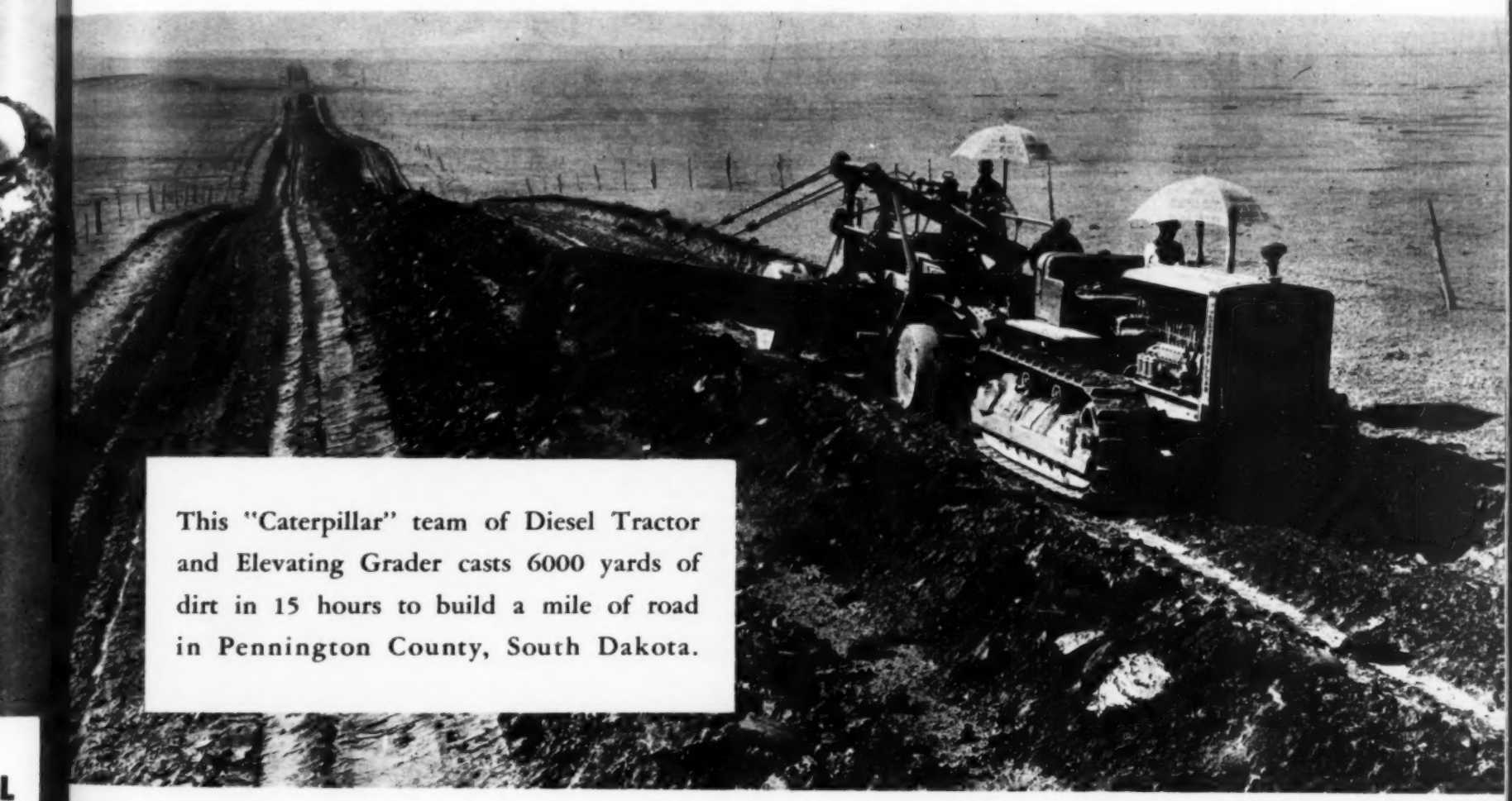
Finishing a Transvaal irrigation canal for concrete lining. Cost-cutting "Caterpillar" Diesel Tractors pull "Caterpillar" Blade and Elevating Graders. The Elevating Grader unit casts the dirt up on the side of the bank and the Blade Grader cuts the bank to within ½ inch of the required dimensions of the canal.

CATERPILLAR

TRACTOR CO., PEORIA, ILLINOIS

AND RECORD COSTS

"CATERPILLAR" EQUIPMENT *OFFERS BOTH*



This "Caterpillar" team of Diesel Tractor and Elevating Grader casts 6000 yards of dirt in 15 hours to build a mile of road in Pennington County, South Dakota.

Better road construction at greatly reduced costs—that's the story when jobs are done with "Caterpillar" Road Machinery and Diesel Tractors. That's why it is the most popular road-building equipment in the world.

WORLD'S LARGEST MANUFACTURER OF DIESEL ENGINES, TRACK-TYPE TRACTORS AND ROAD MACHINERY

LAPLANT-CHOATE

HYDRAULICALLY CONTROLLED

BULLDOZERS

Features—

A-FRAME CONSTRUCTION
Provides many distinct advantages in strength, rigidity, and positive control.

•

HYDRAULIC CONTROL LEVER
Placed at a convenient point within easy reach of operator.

•

ENTIRELY TRACK MOUNTED
Strains in raising, lowering, or pushing are not transmitted to main frame or body of tractor.

•

FRONT MOUNTED PUMPS
Increase operating efficiency, hence are standard equipment on all models.

•

BOX-TYPE FRAME & BLADES
Embody great reserve strength. Strongest known construction.

•

INTERCHANGEABILITY
A LaPlant-Choate Bulldozer may be converted into a Roadbuilder by simply ordering the Roadbuilder Blade and frame assembly. All other parts are interchangeable. This conversion feature likewise applies to Brushcutter and Snow Plow Blades.

Positive and Accurate Control At the Operator's Finger Tips!

When you attach a LaPlant-Choate Bulldozer to a Caterpillar Tractor, you have one of the most efficient earth-moving units on the market. LaPlant-Choate Bulldozers are hydraulically controlled. That means positive and accurate control. Hydraulic power as applied by LaPlant-Choate, embodies sound engineering and long experience. This control enables the operator to perform his work with speed and precision. Keep abreast of the times! Modernize your service with NEW La Plant-Choate equipment! See your nearest Caterpillar Dealer or write direct to LaPlant-Choate Manufacturing Company, Inc.

• SCRAPERS • TAMPING ROLLERS • RUBBER WHEELED WAGONS • BRUSH CUTTERS • SNOW PLOWS

LaPlant-Choate Mfg. Co. Inc.

CEDAR RAPIDS, IOWA

ACTUAL JOB DATA

The Rooter sinks its teeth and the Caterpillar tractor hits the collar, up comes the pavement in big chunks, and a LeTourneau 12-Yard Carryall and Caterpillar RD8 load and haul the chunks away.

PAVEMENT 9 INCHES THICK ripped to smithereens

When Crowe Brothers took the job of building an underpass under the Union Pacific Railway in Los Angeles, they had to move a pavement of tough asphalt and crushed rock mix, 9 inches thick — a mean job any way you look at it. Long time LeTourneau users, Crowe Brothers put a LeTurneau Rooter on the job, with it ripped the pavement into chunks, moved those chunks out of the way with LeTourneau Carryalls. Thus LeTourneau Rooters again job proved that they can rip up tough materials profitably and make scraper operation possible at costs which eliminate much of the excavating and hauling equipment once thought necessary for the handling of macadam, sandstone, hardpan, cemented gravel, and like materials. When you meet such conditions, ask your Caterpillar tractor dealer to show you what a LeTourneau Rooter can do for you.

R. G. LE TOURNEAU, INC.

Peoria, Illinois — Stockton, California

Cable Address: "Bobletorno"

Manufacturers of: Angledozers*, Buggies*, Bulldozers, Carryall* Scrapers, Cranes, Drag Scrapers, Power Control Units, Rooters*, Semi-Trailers.

*Name registered U. S. Patent Office.

LETOURNEAU

ATLAS ACCORDION FOLD ELECTRIC BLASTING CAPS—

PROTECTED inside *and* out!

At the right is a picture of real electric blasting cap protection.

See how the Atlas Electric Blasting Cap is completely surrounded by the leg wires forming a resilient cushion at both ends and on all sides against external shock!

See how the heavy paper tube holds the wires securely in place to keep that protection *effective protection!*

There are 48 folds of wire protecting the detonator of a 6-foot wire Atlas Accordion Fold Electric Blasting Cap . . . yet the complete package is the last word in compactness and convenience *as well as safety!*

The Atlas Accordion Fold is handy to carry—easy to open. The tube is opened and then removed by simple pressure of the fingers. Wires extend naturally and easily into position without kink or snarl. Cap end is easily straightened out for priming without disturbing the rest of the accordion fold.

You've seen the picture. Now get in touch with the Atlas representative and *see the product!*

Photograph of package interior with wires pulled aside to show how completely cap is cushioned on all sides.

ATLAS POWDER COMPANY, WILMINGTON, DEL.

Cable Address—Atpowco

Everything for Blasting

OFFICES

Allentown, Pa.	Joplin, Mo.	New Orleans, La.	Pittsburgh, Pa.	Spokane, Wash.
Boston, Mass.	Kansas City, Mo.	New York, N. Y.	Portland, Oregon	St. Louis, Mo.
Butte, Mont.	Knoxville, Tenn.	Philadelphia, Pa.	Salt Lake City, Utah	Tamaqua, Pa.
Denver, Colo.	Los Angeles, Calif.	Picher, Okla.	San Francisco, Calif.	Wilkes-Barre, Pa.
Houghton, Mich.	Memphis, Tenn.	Pittsburg, Kansas	Seattle, Wash.	

ATLAS

EXPLOSIVES

CHEMICALS ATLAS EXPLOSIVES

JUST "DUCK SOUP" FOR YOU

IF YOU'VE GOT WHAT IT TAKES!

● Keeping hauling costs low is simple, when you've got what it takes! And "what it takes" is ability to handle maximum loads under *all* operating conditions. That's why Athey Forged-Trak 2-Way Dump Trailers—shown here at the start of a mile-long haul—mean bigger profits. They operate on any ground, in any weather. With their down-folding side gates, they dump fast and clean, either right or left. Powered by "Caterpillar" Diesel Tractors, Athey Forged-Trak 2-Way Dump Trailers can show you something NEW in hauling economy. See your "Caterpillar" Dealer or ask us for operating data on your jobs!

ATHEY TRUSS WHEEL CO.

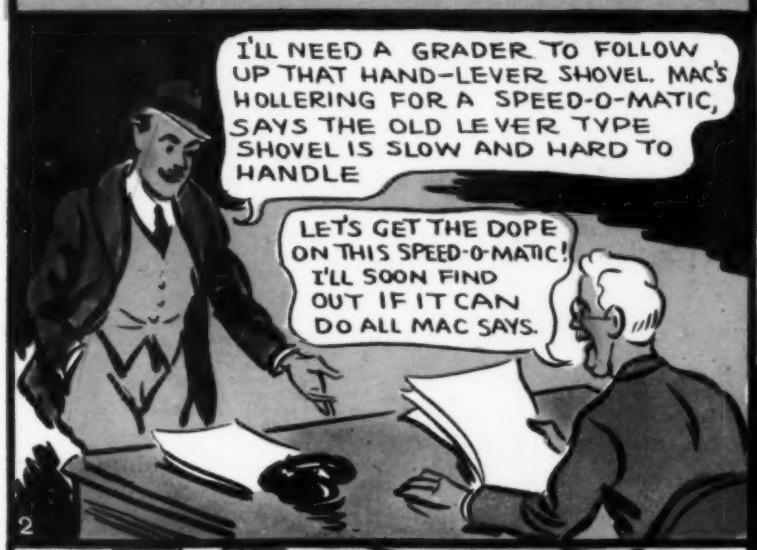
5631 WEST 65th STREET • CHICAGO, ILLINOIS

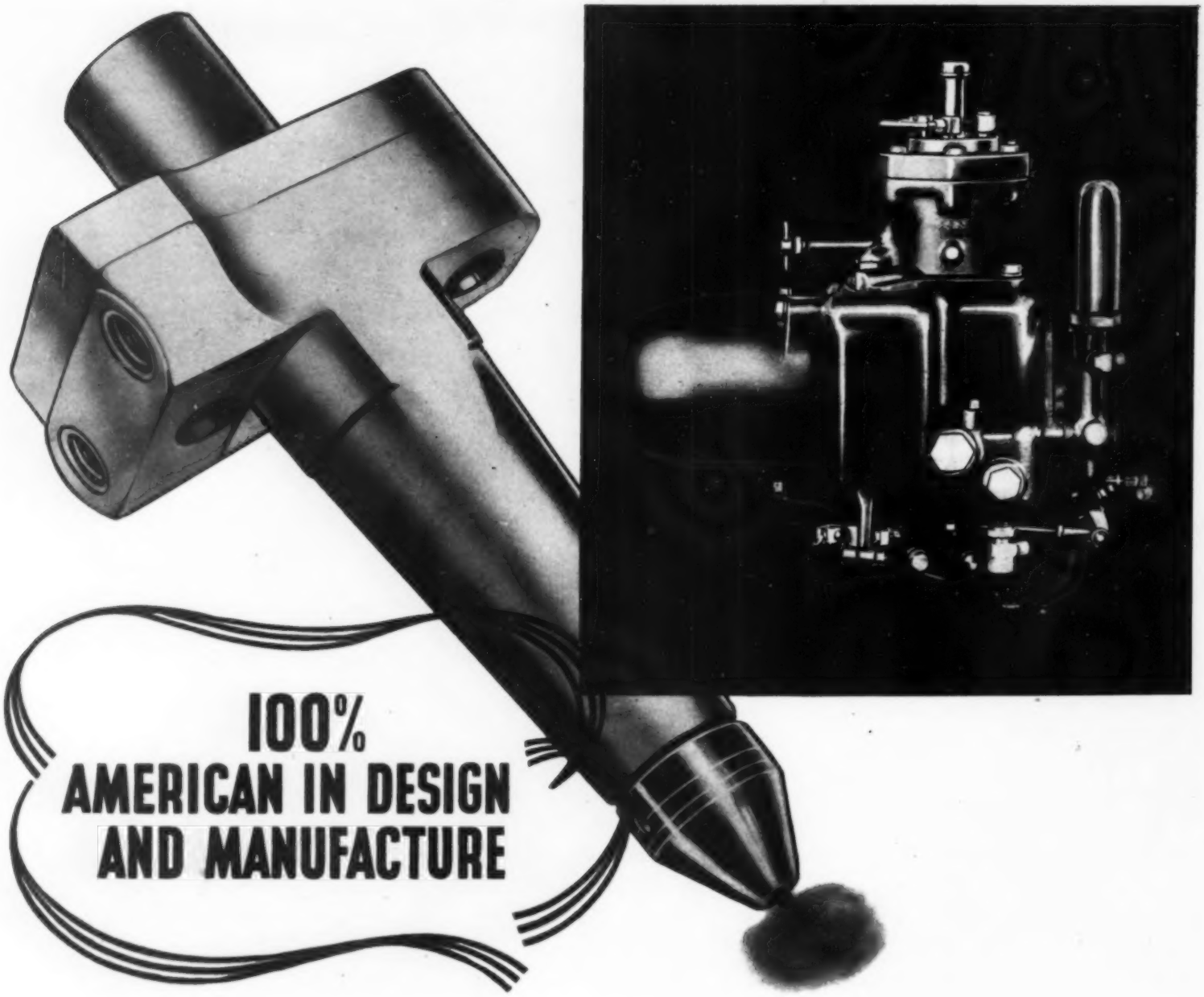
CABLE ADDRESS:
"TRUSSWHEEL" CHICAGO

ATHEY Forged-Trak
REG. TRADE MARK

2-WAY DUMP TRAILERS

MAC O'MATIC AND HIS *Speed-o-Matic*





● The exclusive Cummins Fuel System, which makes possible the cold starting, quick acceleration, smooth running and maximum fuel economy of the Cummins Diesel . . . was designed and perfected in America . . . by American engineers.

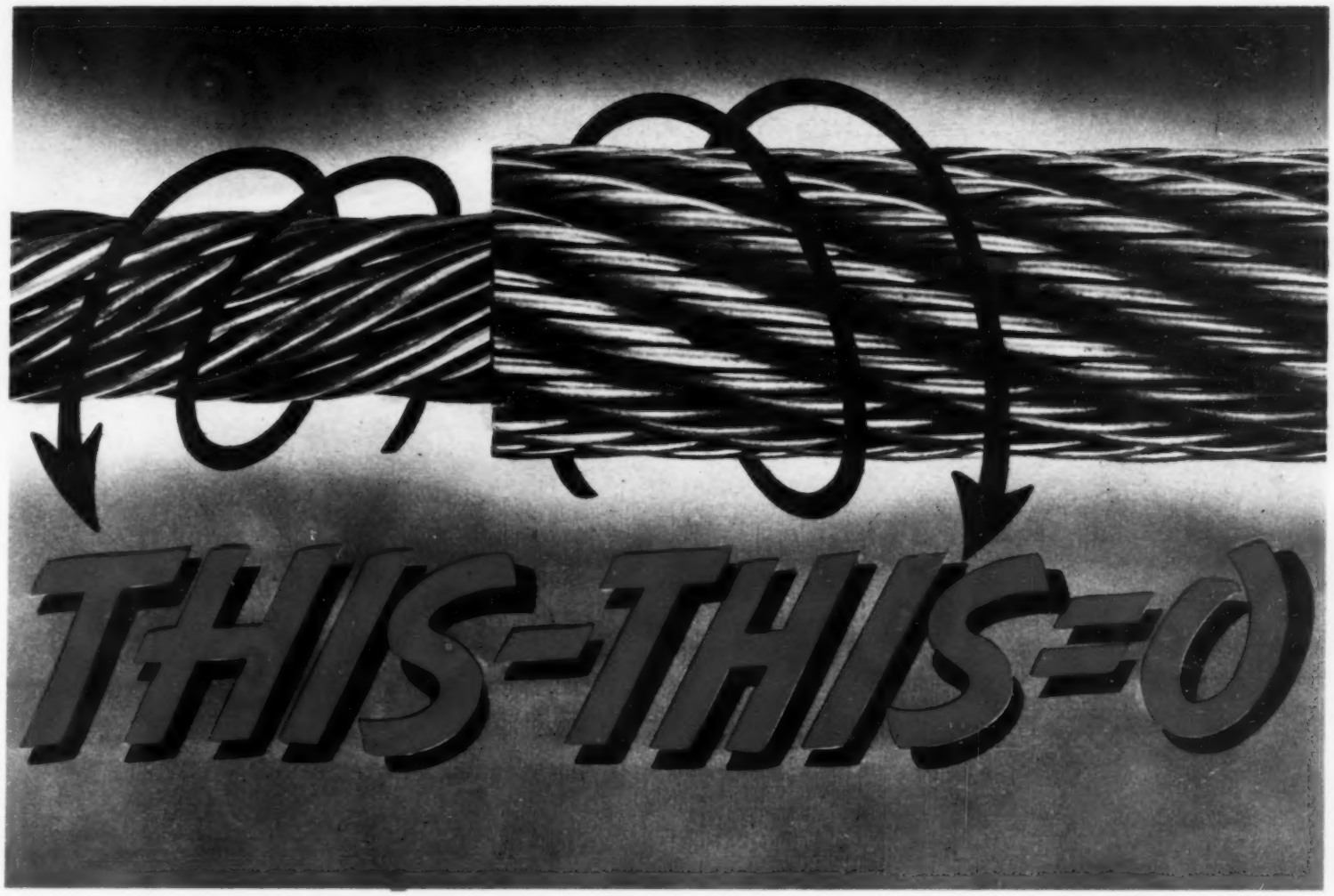
Every detail of the Cummins Diesel is made to the high standards of American Engineering practice . . . which accounts for its long life. Cummins Diesel service is backed by a nationwide dealer service organization and a company who, for nineteen years, has built nothing but Diesel engines.

Should you be satisfied with anything less than a Cummins Diesel?

CUMMINS ENGINE CO., 920 Wilson St., Columbus, Ind.

CUMMINS DIESELS

Pioneers in Modern Diesel Development



Select the Rope that Fits Your Job

The Langlay wire rope core layed in the opposite direction to the lay of the outer strands, exerts a counteraction to the tendency of the outer strands to spin and unlay. A non-spinning rope of this construction is ideally suited for high, vertical lifts of unguided loads. The non-spinning rope is poorly adapted to resist crushing, it must therefore be used with good drum winding conditions. The socket terminal connection applied with molten metal has been found to be the only satisfactory method of fastening a non-spinning rope. The use of wire rope clips causes the rope to be pinched out of shape with resultant sacrifice of rope life. Tell us what rope you are using and we will suggest ways of getting the longest possible life out of it.

WICKWIRE SPENCER STEEL COMPANY, *General Offices:* 41 East 42nd Street, New York. *Sales Offices and Warehouses:* Worcester, New York, Chicago, Buffalo, San Francisco, Los Angeles; *Export Sales Dept.:* New York. WICKWIRE SPENCER SALES CORPORATION, New York, Chattanooga, Tulsa, Portland, Seattle.

WIRE ROPE
by Wickwire Spencer

Wickwire Spencer also manufactures all sizes and types of Wire Rope in Wisscolay.

WICKWIRE SPENCER STEEL CO.
41 East 42nd St., New York City
Please send me your new Rope Manual that tells how to make wire rope last longer.

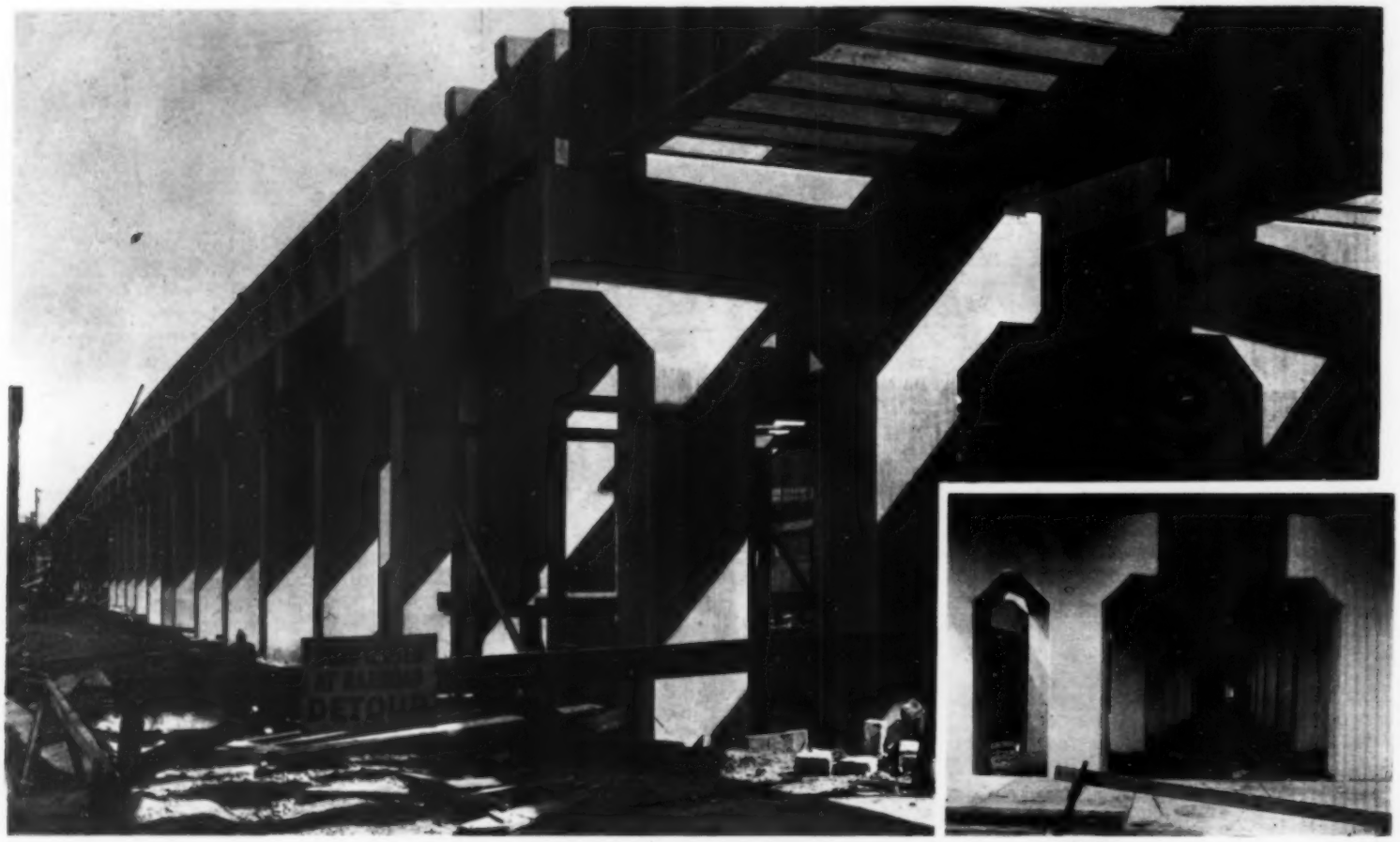
Name_____

Firm_____

Address_____

City_____ State_____

Saved *three months time*



and over 4,000 dollars with

LEHIGH EARLY STRENGTH CEMENT

Through the severe winter of 1935–36 Lehigh Early Strength Cement enabled the maintenance of job schedule for the Staten Island Rapid Transit Company grade-crossing elimination work at Stapleton. (B. & O. R.R., owner.) Besides maintaining the construction schedule, the Faircroft Engineering Corporation, Brooklyn, N. Y., E. W. Foley, President, saved over four thousand dollars in form costs, labor costs and overhead. 40 fewer form sets were needed than would have been required with normal portland cement and the work was completed 3 months sooner.

Regardless of the temperature, full service strength concrete is obtained in $\frac{1}{3}$ to $\frac{1}{5}$ of the time required when normal portland cement is used. Use Lehigh Early Strength Cement whenever time saving is important. It saves labor, reduces overhead costs, saves on form costs, and in cold weather reduces heat protection costs.

Send for 32-page book, "Lehigh Early Strength Cement—What it is, what it does, and what it can be used for"

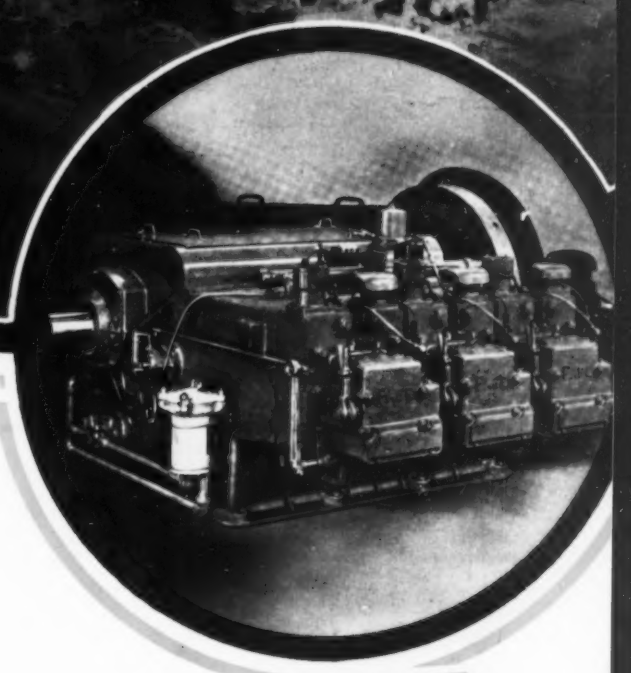
Look for the Red Arrow

LEHIGH CEMENT

LEHIGH PORTLAND CEMENT COMPANY

Allentown, Pa., Chicago, Ill., Spokane, Wash.

HIGH YARDAGE WALKING DRAGLINE *plus* *The Economy of a Diesel Designed for Dragline Work*



PAGE WALKER SERIES "600"

3 to 5 Yard Machines — Moderately Priced

With hoist, load, and swing speeds for high yardage 24 hours per day, and a simple positive walking mechanism for immediate movability in any direction on even the softest ground, Page Walkers also bring to dragline users a medium speed, horizontal, heavy duty engine designed particularly for the severe demands of dragline service.

Because Page Diesels have been built especially for dragline use, many fourteen and fifteen years old are still in constant operation.

If you require more and cheaper yardage, continuous operation every day, month after month, and complete independence of weather conditions, investigate thoroughly the Page Walkers powered by the Page Diesel!

For information write—

Page Engineering Co.

Clearing Post Office • • Chicago, Ill.

PAGE AUTOMATIC DRAGLINE BUCKETS
PAGE WALKING DRAGLINE MACHINES
PAGE DIESEL ENGINES

PAGE ENGINEERING COMPANY
CLEARING POST OFFICE CHICAGO, ILLINOIS

Please send information on a Page "600" Walker. Size _____

Name _____

Address _____

City _____ *State* _____ "S

OIL MIX No. 54 Tandem Drive Speed Patrol owned by the City of Great Falls, Montana

CONSTRUCTION Railway relocation job of Ralph Meyers near Mansfield, Ohio

BALANCED Design

MAKES THE DIFFERENCE

GRADING & MAINTENANCE Road job of Banks Construction Co. near York, Pennsylvania

ONLY A-C SPEED PATROLS GIVE YOU ALL THESE ADVANTAGES:

- **MORE EFFECTIVE BLADE PRESSURE**... 58.6% to 61.6% of weight is converted into blade pressure, highest of any motor grader. A result of long wheel base, long blade base and center engine mounting.
- **BIG, STURDY 64-INCH CIRCLE**...supplies rigid moldboard support. 35% of circle area is supported in guide shoes—double to triple the usual support.
- **ALL-BOLTED CONSTRUCTION**... prolongs frame life and reduces maintenance. Alloy steel "stretch-proof" bolts and double-thickness nuts.
- **COMPLETE WEAR TAKE-UP**... is your assurance against moldboard chatter, sloppy work and excessive repair bills.
- **PROPER BALANCE AND CONTROL**...for more efficient operation. All parts balanced to work together. Ample weight on front wheels to prevent side-slipping. Engine weight works WITH the blade—not against it.
- **MODERN ENGINES**.. of Allis-Chalmers own make. Gasoline, distillate . . or Controlled Ignition of Diesel fuel oil.
- **POSITIVE TRACTION**.. because of correct weight distribution. In Tandem Drive Patrols, tandem assemblies pivot with unusual freedom—assuring positive traction in irregular footing. No-differential final drive.
- **CORRECT SPEEDS**... for maintenance, oil mixing, scarifying, snow plowing, ditching or traveling. 2.3 to 10 M. P. H.

These are just a few of the reasons why so many contractors and public bodies are specifying A-C Speed Patrols.

ALLIS-CHALMERS SPEED PATROLS

TRACTOR DIVISION—MILWAUKEE, U. S. A.

SINGLE OR TANDEM DRIVE...NO. 42 AND NO. 54 SIZES...GASOLINE, DISTILLATE, DIESEL FUEL OIL

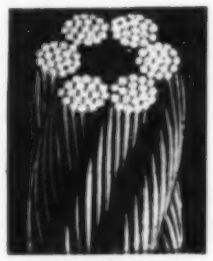
now . . . Textiles *are* *preshrunk*

now . . . Wire rope *is preformed!*

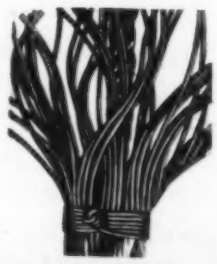
● The preforming of wire rope is the same type of basic improvement as the sanforizing of textiles. Preforming means that each wire and strand in wire rope is molded or shaped (*in advance*) to the exact helical curve each must assume in the completed rope.

Preforming tends to reduce internal stress or strain. And *that* is the reason why preformed wire rope lasts so much longer, gives so much better service.

There are at least a dozen ways in which preformed wire rope is superior. Ask us to send you a sample of preformed wire rope. Learn all the facts about its true superiority. For many wire rope applications, preformed rope will give you much greater dollar value.



PREFORMED



NON-PREFORMED

LICENSEES UNDER PREFORMED WIRE ROPE PATENTS
Educational Bureau • 520 North Michigan Avenue • Chicago, Illinois

Preformed WIRE ROPE

for SAFETY · ECONOMY · EFFICIENCY

"GULF gives us the best service"

...says
THIS CONTRACTOR ON BIG MASSACHUSETTS RESERVOIR JOB

"THE BEST SERVICE"—that's what contractors want from an oil supplier. And that's why contractors everywhere are relying on Gulf.

Gulf service means not only the prompt delivery of fuels and lubricants for the job. It includes the friendly cooperation of the Gulf engineer, a lubrication expert whose one aim is to help contractors improve the efficiency of their equipment through the proper use of the oils and greases that are best suited to each purpose.

There's a dollar and cents value in that kind of service. Any contractor, from Maine to Texas, can have the benefit of it.

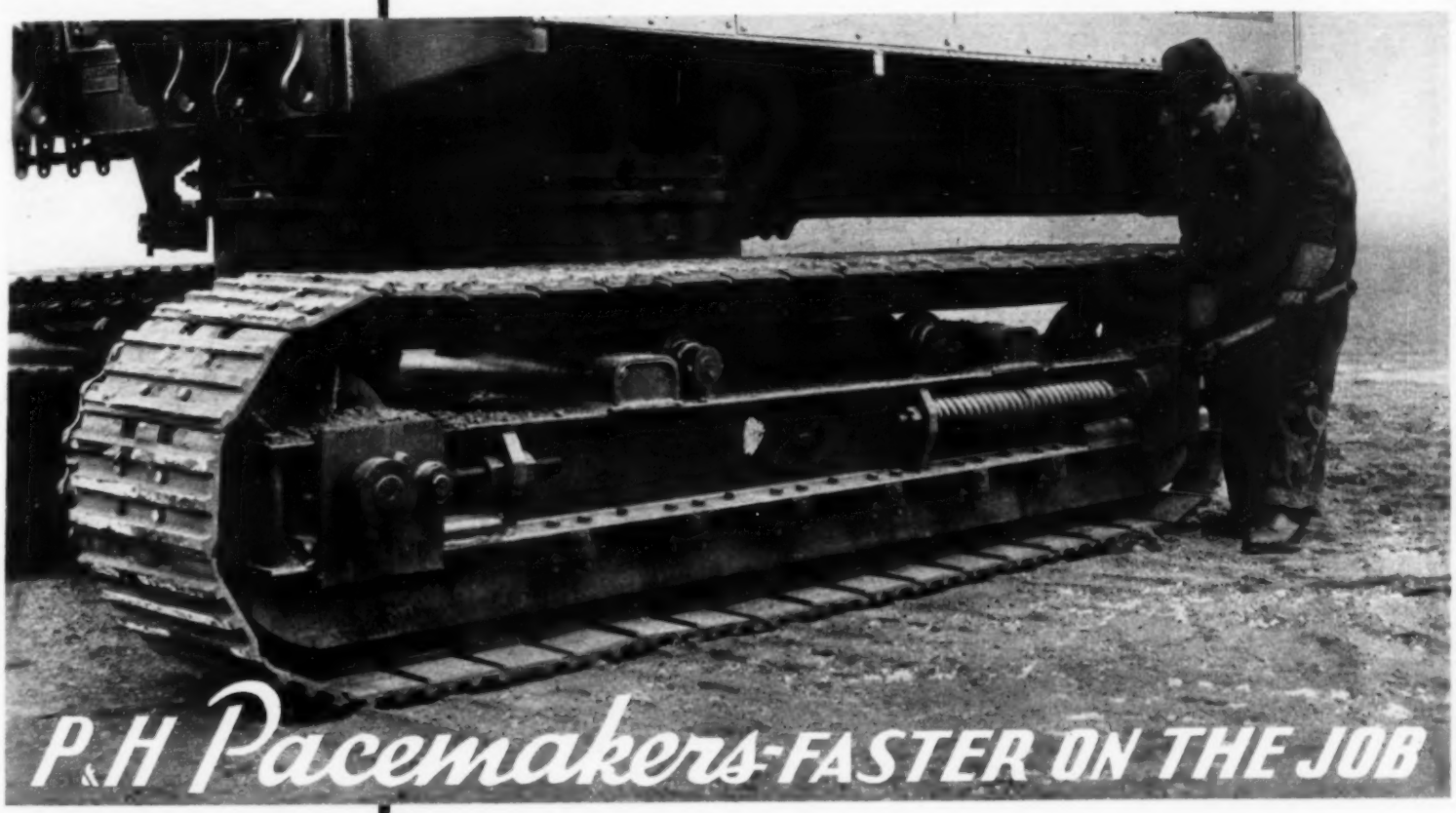
GULF OIL CORPORATION
GULF REFINING COMPANY
GENERAL OFFICES: GULF BLDG., PITTSBURGH, PA.

GULF INDUSTRIAL LUBRICATION

Makers of **THAT GOOD GULF GASOLINE AND GULFLUBE MOTOR OIL**

"We put an end to crawler troubles when we got this new P&H Pacemaker. It's built for travel—proved for travel—in millions of miles of tractor service." Martin Lewein — shovel operator.

Here's how we get SHOCK ABSORBING ACTION *in these* TRACTOR-TYPE CRAWLERS



● The tractor-type crawlers on the P&H Pacemaker are always kept at proper tension by these compensator springs. There's no slack in the crawler track—none of that jerkiness to cause damage. At the same time, there's ample shock-absorbing action in the springs themselves to protect the crawlers against distortion or breakage. These compensator springs automatically adjust the crawler track for proper action on long or short hauls, in sand and gravel or knee deep in muck. Crawler troubles are a thing of the past on these P&H Pacemakers—one of the features that make them faster on the job.

HARNISCHFEGER CORPORATION
4494 W. National Avenue *Established 1884* Milwaukee, Wisconsin

Warehouses and Service Stations:
Hoboken — Memphis — Jacksonville — Dallas — Seattle — Los Angeles — San Francisco

HARNISCHFEGER CORPORATION
EXCAVATORS • ELECTRIC CRANES HOISTS • MOTORS • ARC WELDERS

Check the Advantages of BLAW-KNOX TRUKMIXERS

✓ DEPENDABLE PERFORMANCE

✓ QUALITY CONCRETE

✓ MAXIMUM PROFITS

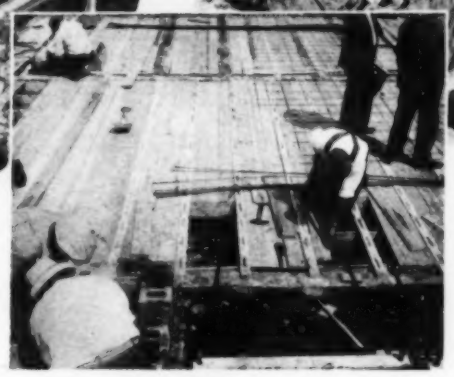
- The consistently better concrete which you can produce and deliver with Blaw-Knox TRUKMIXERS and Agitators will bring a greater share of the available concrete business to your plant.

We would like to tell you why Blaw-Knox Trukmixers not only get business for you, but save you money in low depreciation and maintenance.

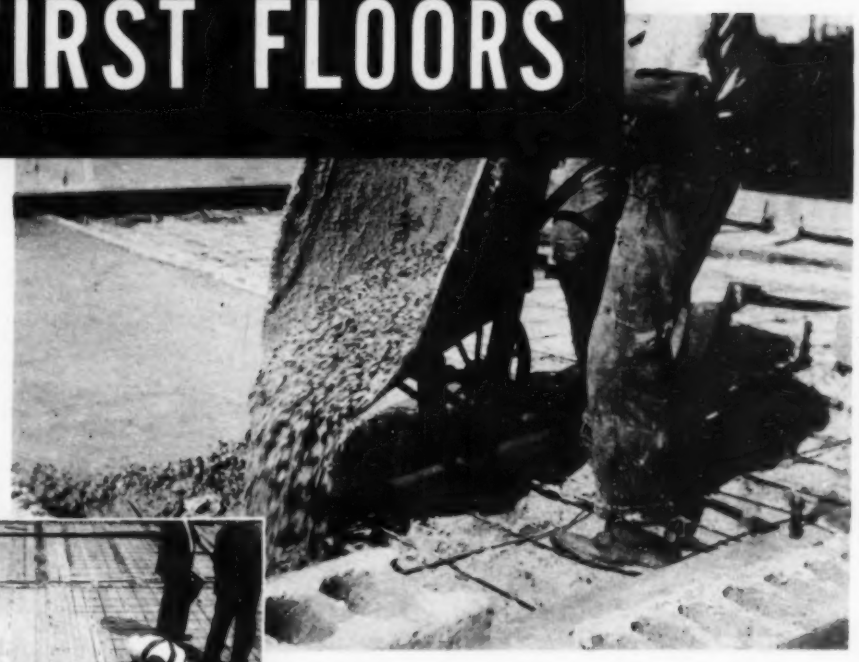
BLAW-KNOX COMPANY
2086 FARMER'S BANK BUILDING PITTSBURGH, PA.
Offices and Representatives in Principal Cities

SEND US 14,000,000 SQ. FT. OF CONCRETE FIRST FLOORS

Erecting precast concrete joists.



Setting forms and reinforcing for floor slab.



Placing first floor slab, "New American" Demonstration Home, Grant Park, down-town Chicago

That was the order from home buyers in 1936 — Contractors: get your share of this important business!

Think of what this means to you! More than 14,000,000 square feet of concrete first floors were built into new homes during the past year! A tremendous increase over any other year — yet only a prophesy of the business that awaits contractors in 1937.

Concrete floors are warm and comfortable — and firesafe! They never creak or sag; they stiffen and strengthen the entire house; they take any covering or a variety of attractive finishes. And with such developments as precast joists, the cost is surprisingly low.

The surest way to cash in on the demand for concrete floors—and complete concrete homes — is to tie in with the realtors and subdividers who are organizing construction departments or seeking connections with builders. Never mind if you have never been in the residence field. As a general contractor familiar with concrete you have the experience, equipment and personnel to handle the job whether on single houses or on hundreds.

Write us for further information on the profit opportunities in house construction, and the practical booklet, "Precast Joist Concrete Floors."

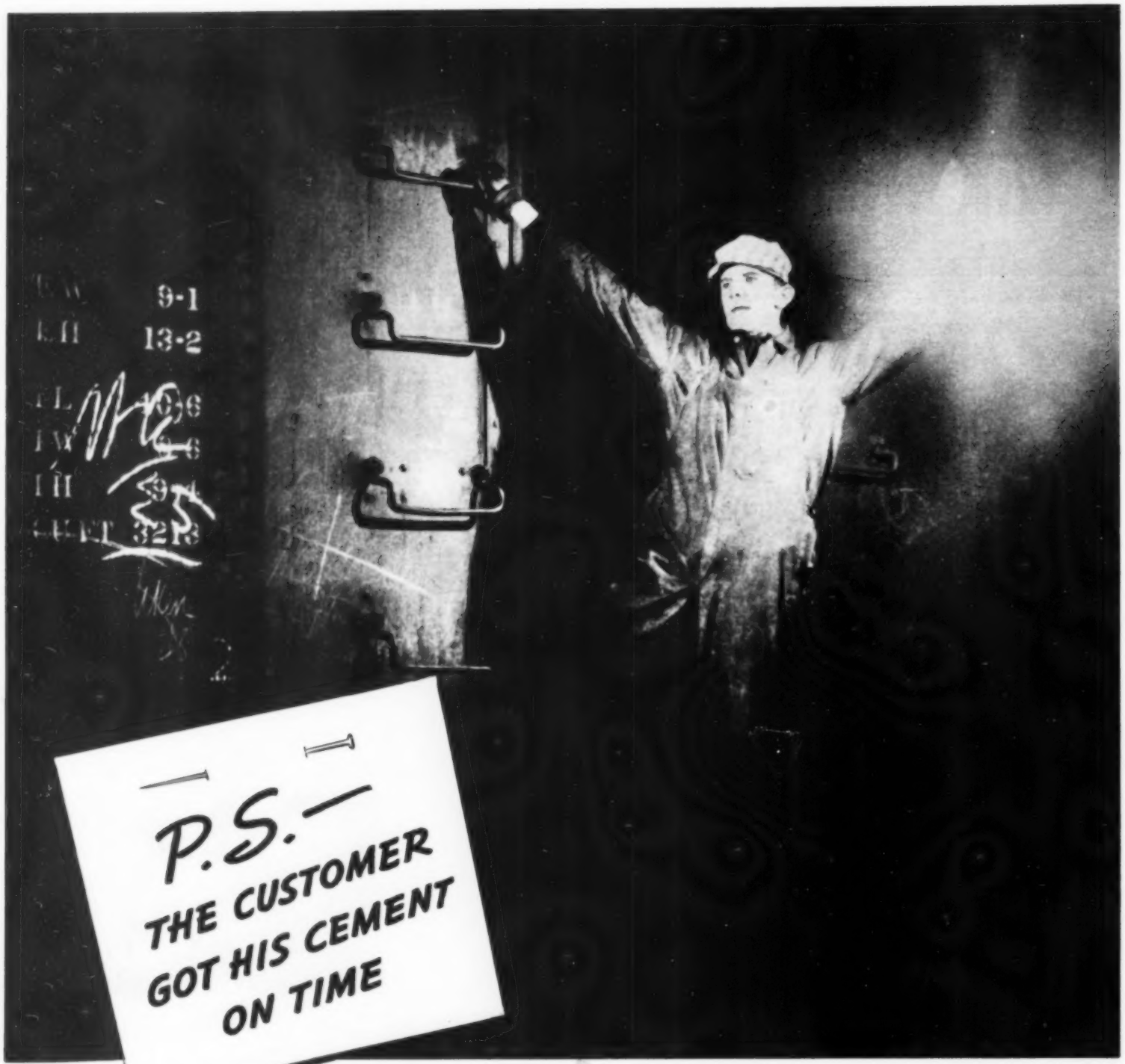
PORTLAND CEMENT ASSOCIATION

Dept. 3-16A, 33 W. Grand Ave., Chicago, Ill.

A national organization of engineers and scientists working to improve and extend the uses of concrete.

AND BE SURE TO FIGURE MY HOUSE WITH CONCRETE FLOORS.

OKEH, MR. BROWN. EVERYONE SEEMS TO WANT THEM THIS YEAR.



● A Minnesota customer who had run short of cement called our Duluth office one Saturday afternoon. It was closed, so he tried the plant.

"I think Mr. Rudd can help you," said the operator. "He's working in the laboratory this afternoon."

So, during the next twenty minutes Ray Rudd, laboratory man, divorced himself from his test tubes and became a service man. And he did such a good job that the customer went to the trouble to write us about it.

We mention this incident to illustrate this point:

Whenever any of us here at Universal Atlas can help you, you'll find us ready to pitch in and do it. We realize that, aside from getting good uniform cement—and perhaps some technical information—your further interest is in getting the cement when you need it.

That is where service comes in.

UNIVERSAL ATLAS CEMENT CO.
(United States Steel Corporation Subsidiary)
208 South La Salle Street, Chicago
New York · Cleveland · Philadelphia · Albany
Boston · St. Louis · Des Moines · Birmingham
Waco · Kansas City · Pittsburgh · Duluth · Minneapolis

G-5

Universal Atlas
CEMENTS

Established 1919
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Construction Methods and Equipment

ROBERT K. TOMLIN, Editor

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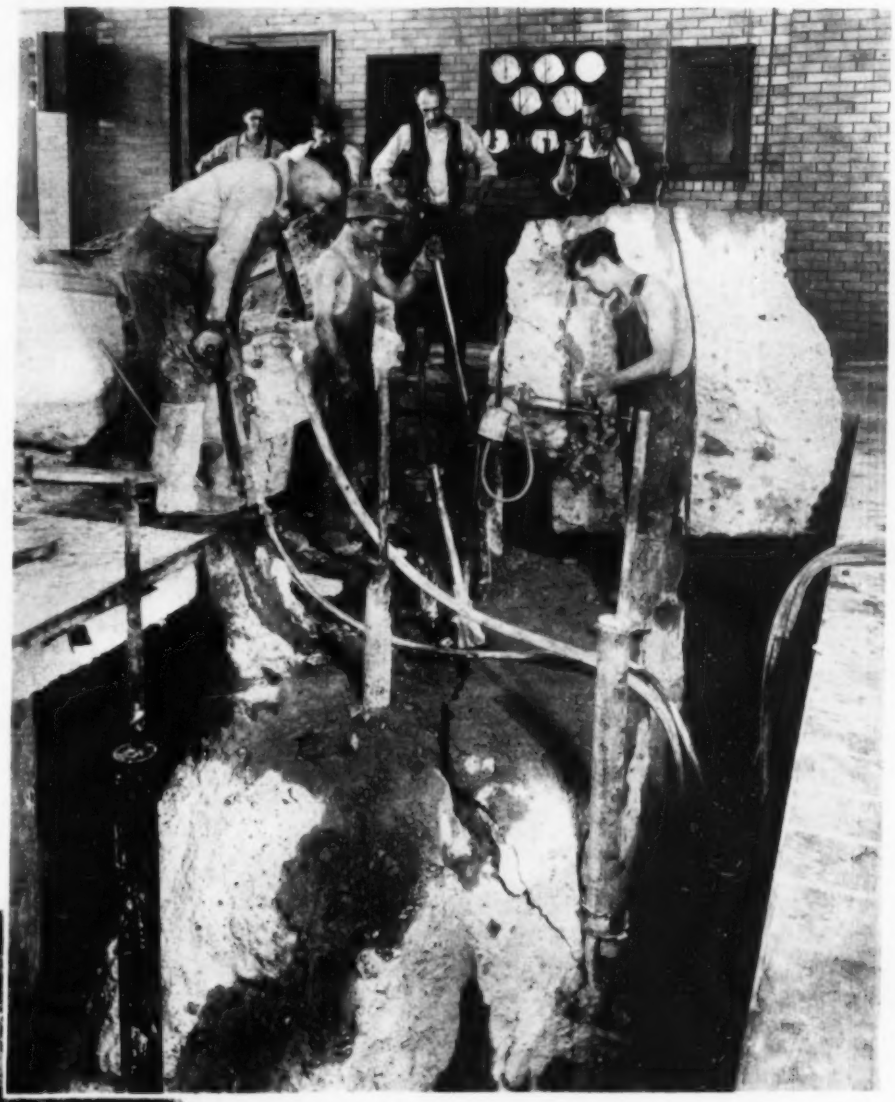
Hydraulic Cartridge

Fractures Mass Masonry

HYDRAULIC CARTRIDGES inserted in drilled holes have for the last 7 years broken concrete and other types of mass masonry into large blocks for removal from demolition jobs of the Hydraulic Concrete Breaking Co., Detroit, Mich., sole concessionaire of the device. The method utilizes an hydraulic cartridge of 90-lb. weight consisting of a strong steel cylinder 4 in. in diameter with rams on one side which are thrust out by hydraulic pressure transmitted through lead pipe from a small pressure-generating chamber. A pressure of 20 tons per square inch can be exerted by the cartridge.

Because it works without shock or creation of dust, the hydraulic cartridge can be used where explosives cannot. Although the holes required for its use are 4 in. in diameter the contractor drills them at the rate of 8 in. per minute and puts down a 2-ft. hole at an average cost of 60c, including compressed air, labor, equipment and drill bits. Dust is eliminated in drilling the holes.



HYDRAULIC PRESSURE exerted through rams in side of 4-in.-diam. cartridge breaks concrete in Detroit power plant without dust or other disturbance. Piece being broken by cartridge weighs about 8 tons, while block suspended in cable weighs about 11 tons. Man on drill is preparing hole for next thrust. Three men and one supervisor complete demolition of 186 cu.yd. on this job in 10 days.

OLD BRIDGE ABUTMENTS, walls and deck slab at Grand River-Warren Ave. grade separation, Detroit, are broken by hydraulic cartridge into pieces weighing 2 to 8 tons for quick removal. Mat is heavily reinforced; abutments and walls are doweled. With fair weather and traffic detoured around job, demolition progresses rapidly by hydraulic-cartridge method.

A skilled operator finds the cartridge simple to use. Each break takes about 4 min., and the fracture occurs without any explosion while the operator remains at the machine. An operator is trained for demolition work in 3 to 5 months.

Although the hydraulic method of demolishing concrete is more expensive than explosives, the contractor has found that the ability to break blocks of 2 to 10 tons for loading into trucks or railroad cars often means a saving in final cost as well as greater speed in completing the work. Under favorable conditions on the Grand River-Warren Ave. grade separation in Detroit, the Hydraulic Concrete Breaking Co. broke and removed 1,382 cu.yd. of concrete in 1,583 man-hr. for the Bryant & Detwiler Co., contractor.

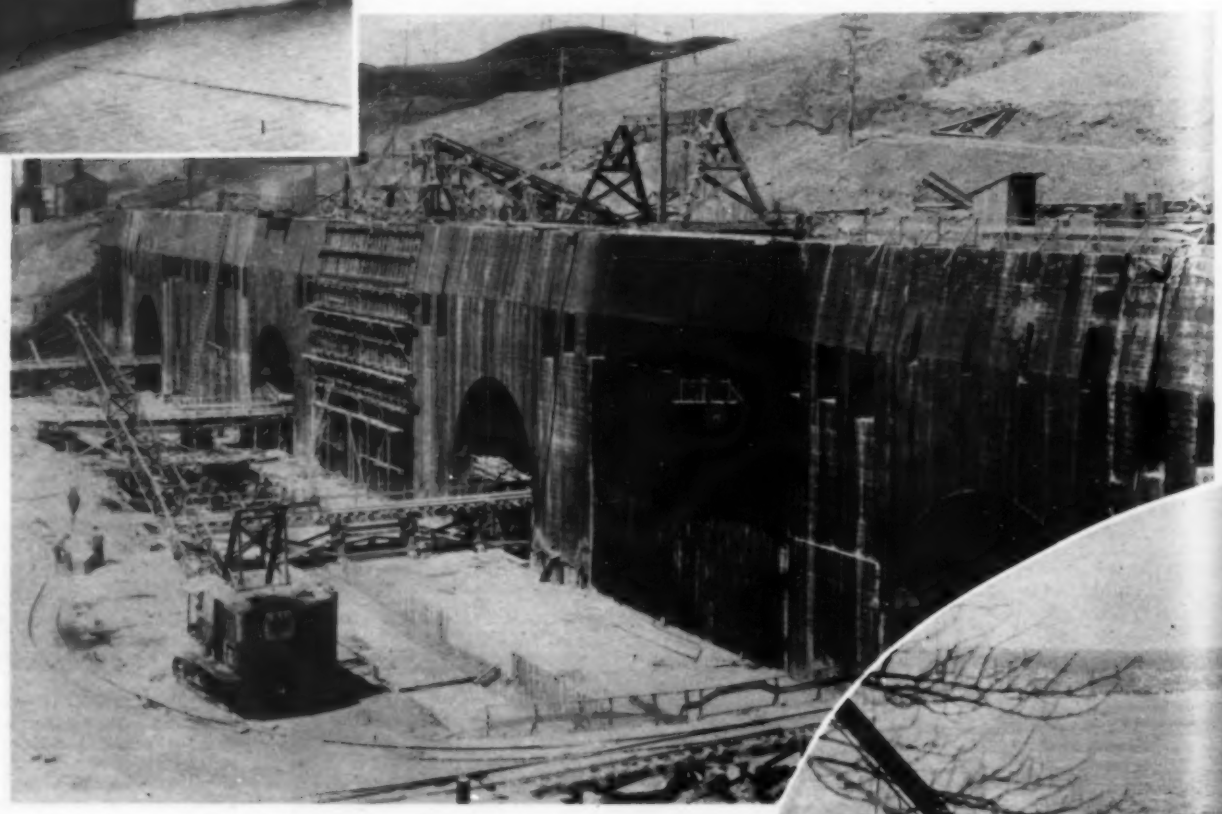
This Month's "NEWS REEL"

ADMINISTRATION BUILDING OF NEW YORK WORLD'S FAIR

is about to be put under contract calling for completion of structure in time for initial occupancy late in August. Two-story building 458 ft. long, with maximum breadth of 235 ft., provides 57,000 sq.ft. of floor space exclusive of executive suites and great octagonal hall jutting out from office wings. Walls will be light stucco on steel and wood frame. WORLD'S FAIR FLAG *(left)* is unfurled by Grover Whalen, president of Fair Corporation, on set-back of Empire State Building, where offices now are located. Standing at Mr. Whalen's right are, in order, Mrs. Vincent Astor, chairman of National Women's Advisory Committee; Winthrop W. Aldrich, chairman of Men's National Committee; and Gen. Dennis E. Nolan, director of State Participation.

FORT PECK INTAKES

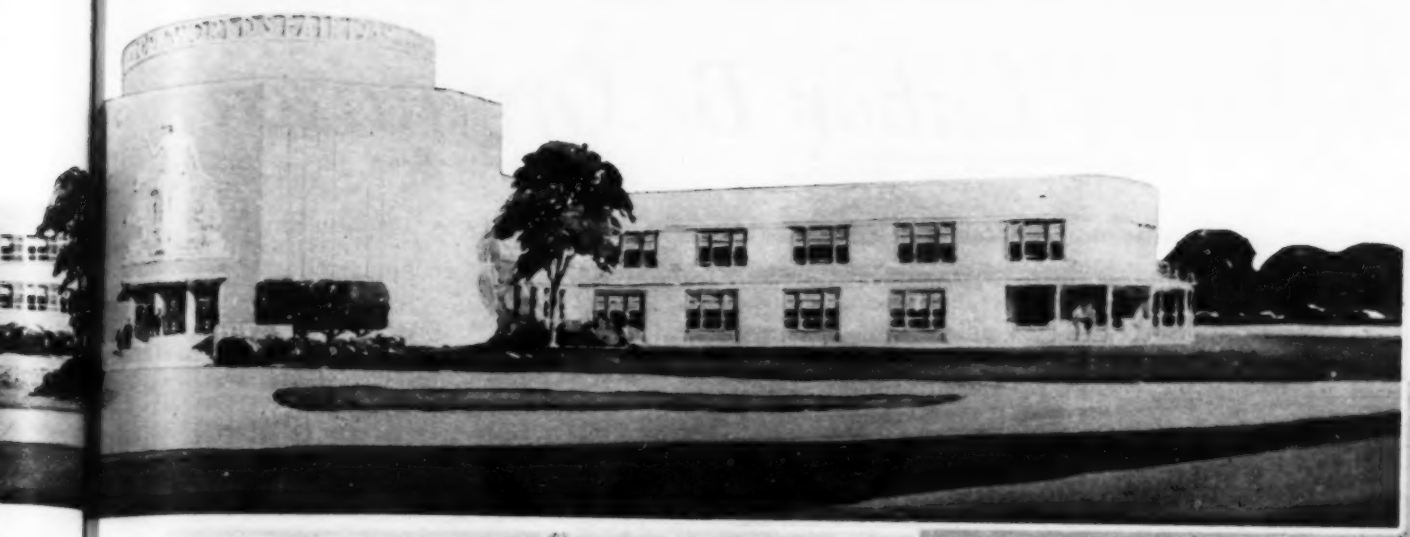
(right) **will admit Missouri River water to four 24-ft. 8-in. concrete-lined diversion tunnels of 6,323-ft. average length during closure of 100,000,000-cu.yd. earth-fill dam being built by U. S. Engineers with initial PWA appropriation of $49,881,000.**



TYGART RIVER DAM

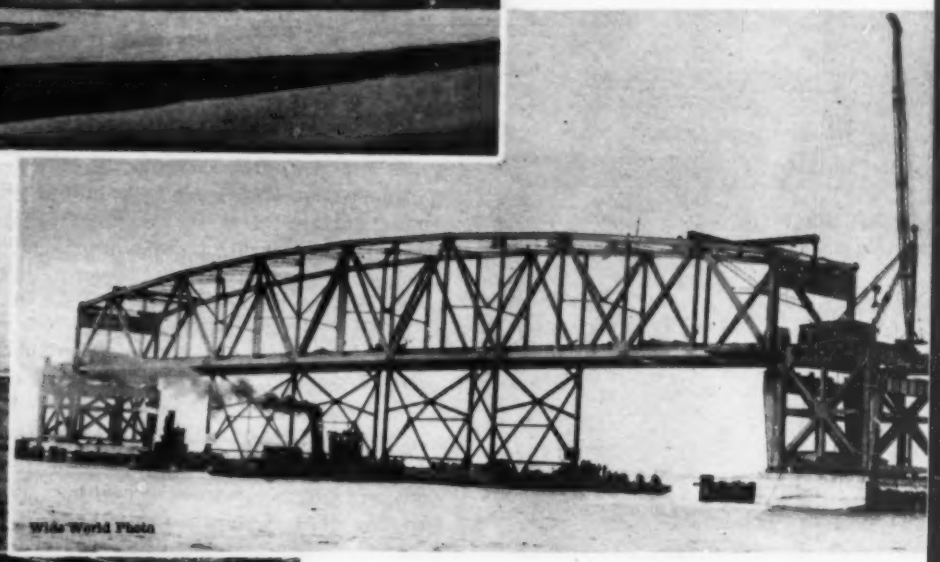
(below) **being built near Grafton, W.Va., by Frederick Snare Corp. under direction of U.S. Engineers with part of $10,000,000 PWA allotment for this project approaches final maximum height of 232 ft. above sandstone foundation. Total crest length of 1,850 ft. includes central overflow section 490 ft. long containing eight steel-lined culverts 5 ft. 8 in. by 10 ft. in section. Stilling basin is formed by low dam 28 ft. high about 200 ft. below toe. Dam, requiring about 1,100,000 cu.yd. of concrete, is being built in 34 monoliths by electric gantry whirler cranes on steel trestle raised three times as height of structure increases.**

Eric J. Baker Photo



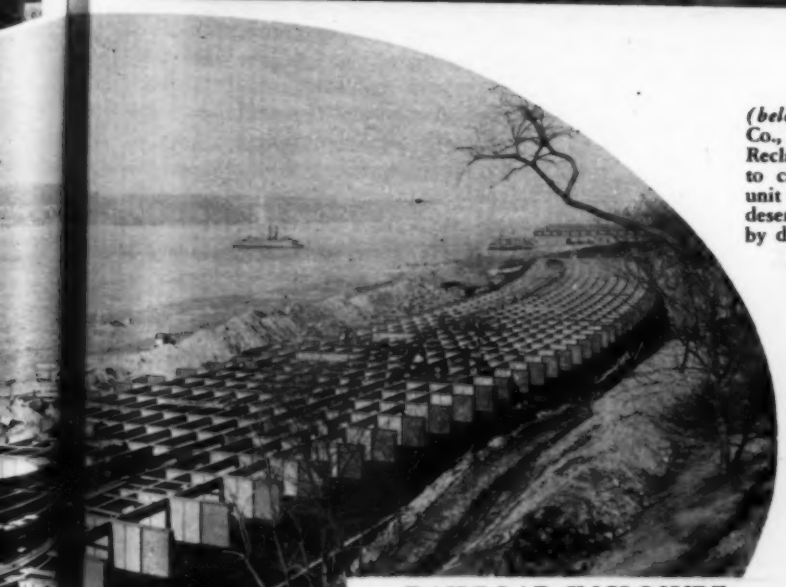
LONGEST HIGHWAY LIFT SPAN

(below), 540 ft. in length, just 4 ft. shorter than new railroad lift span across Cape Cod canal, is maneuvered into place on tower brackets of Marine Parkway bridge crossing Rockaway Inlet, Brooklyn, following erection on two car floats by steel stiff-leg derrick mounted on one partially completed tower.



NECHES RIVER BRIDGE

(left) at Port Arthur, Tex., has succession of concrete pedestal piers on south side of river constructed by floating equipment operating in 3,500-ft. canal dug in marshy ground alongside structure. Substructure work involving eight caisson piers sunk 90 to 102 ft. below mean Gulf level and 68 pedestal piers resting on untreated timber piles will be completed by Union Bridge & Construction Co., of Kansas City, Mo., contractor, by June 1. Taylor-Fichter Steel Construction Co., New York City, has started work on $1,613,500 superstructure contract involving 9,285 tons of structural steel. Main river span 680 ft. long will have vertical clearance of 176 ft. With approaches, bridge project totals 5.7 mi. in length. PWA allotment provides funds for $2,750,000 cost. Work is directed by Texas Highway Department, with G.G. Wickline as resident engineer in charge.

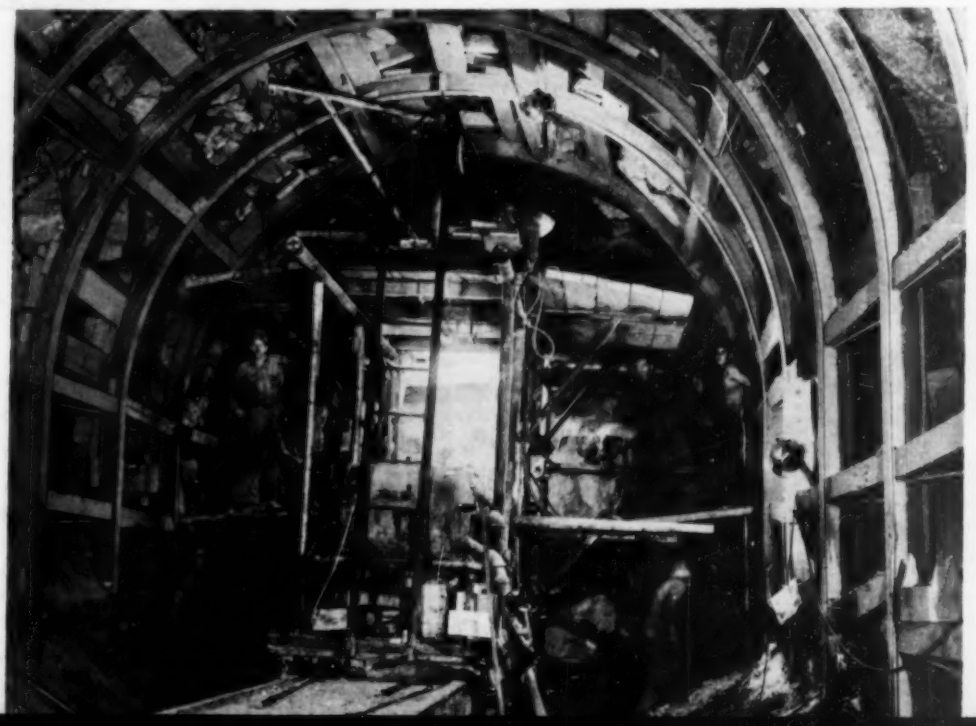


RAILROAD INCLOSURE

of New York Central freight tracks along west side of Manhattan Island, preparatory to grading continuous unscarred slope facing Hudson River for city's Riverside Park, includes rigid-frame section from 98th to 121st. St. Steel rigid frame bents of 66-ft. clear span are erected on 17-ft. centers by American Bridge Co., contractor, for New York Central Railroad and New York City Parks Department, Madigan-Hyland, designing and supervising engineers. Details of bent are shown in photograph in "Job Oddities" department of this issue.

GILA PROJECT TUNNEL

(below) being driven by Mittry Bros. Construction Co., Los Angeles, contractor, as part of U.S. Bureau of Reclamation's gravity main canal from Imperial dam to carry Colorado River water to first 150,000-acre unit of eventual 650,000-acre irrigation development in desert east of Yuma, Ariz., is advanced through rock by drilling and blasting full section with aid of traveling jumbo supporting battery of drifter drills. Tunnels are being built to full capacity, while open-cut canal sections are being excavated at this time only to serve first unit. Two tunnels are 20 ft. in diameter and total 5,900 ft. in length. Imperial dam also will divert water to All-American Canal serving Imperial Valley on California side of Colorado River.



Should Highway Labor Be Organized?

E. J. RAINEY

An address before the Highway Contractors' Division of the American Road Builders' Association at its thirty-fourth annual convention in New Orleans, La., January 11-15.

By E. J. RAINEY

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S. J. Groves & Sons, Inc.,
Minneapolis, Minn.

IN DISCUSSING the subject of organized highway labor I am mindful of the fact that those of us who are engaged in the highway construction industry have had relatively little experience with labor organizations. With the exception of some of the larger metropolitan areas, highway labor up to the present time has not been organized, and we have not had the problems and experience which have come to contractors in some other branches of construction where unionized labor is used either wholly or in part. What experience we have had has been more or less satisfactory, and, whether we like it or not, it is a question we must face. In view of the trend of the times in that direction, and in view of the sympathetic attitude of the present administration regarding the rights of labor to organize, it is well indeed that we, of the construction industry, realize that we must face these changing conditions.

In Minnesota we are informed that an attempt will be made to organize all highway labor this spring. This will undoubtedly be agreeable to the highway department under our present state administration. To oppose this trend will probably accomplish little. It would appear to be better to cooperate fairly and intelligently with labor in this movement than to try to stem the tide. Labor representatives in Minnesota have told me that they realize labor must have the full cooperation of the contractors if labor is to prosper in highway work. In other words, labor realizes that without the contractor it would fail in setting up a uniform wage scale in highway work.

Union Influences — Although the highway contractor has had no dealings with organized labor, except in a few areas, every highway contractor has, under the numerous regulations which have developed in the last few years, worked in great measure under union conditions, whether he has realized it or not. The only difference is that these regulations have been made by public officials having charge of the work rather than as a result of direct negotiation with organized labor. Nevertheless, these conditions owe their origin largely to the activities of organized labor with the United States Congress and the Executive Department. Today, the contractor finds himself operating under contracts which tell him just how many hours his men may work, and what wages he must pay the men, how often he must pay them and numerous other conditions of employment, even to the extent of how

"The building craft unions have been bending every effort to extend their power into the highway field."

many men, or rather how many man-hours of employment, he must give on certain projects. In metropolitan areas the highway contractor has, of course, felt more directly the influence of craft unions, predominantly those craft unions in the building field. These building craft unions have been bending every effort to extend their power into the highway building field.

Wage Scales — The first big question in connection with the use of organized labor is that of the wage scale. The greatest fear is the ever-present threat of strikes, which at times seem unavoidable as a result of wage controversies and working hours. In the areas where union labor is used, representatives of the contractors and the unions get together in the early spring and effect agreements regarding these questions. A wage scale satisfactory to both sides is worked out. This agreement as to the wages to be paid on one job or in one area naturally is considered in all subsequent bidding in that territory. If such agreements are ignored, and either a strike results or a higher wage scale must be paid, the contractor finds himself in a situation which, to put it mildly, is embarrassing. But where such agreements are lived up to — and I believe they are in most cases — the contractor gets along very well. Of course, sometimes inconsistencies appear in these wage scales and become aggravating. As an example I might cite cases where such men as shovel runners are paid very little more than the men who drive light trucks. The shovel runner must serve a long apprenticeship, and an experienced man is usually of great value to the contractor, while truck driving requires relatively little experience and should be paid on a scale comparable to its value.

In those areas in and around large metropolitan centers where organized labor has been tried, it has been more or less satisfactory in most cases. Naturally, areas like these afford the best opportunities for its use. The old established unions are able to maintain an active list at all times of men classified for the various types of jobs necessary on construction work. Contractors, therefore, are able quickly to organize the necessary crews from experienced labor, with a substitute list always available.

In sparsely settled communities, however, it is a different story. The class of labor available in suburban and in so-called farming centers is, in most cases, non-union. Therefore, it

"If labor is properly organized it can cooperate very efficiently in this matter (of having work done by contract rather than by government forces.)"

seems to me that to attempt to organize highway labor on projects in sparsely settled districts would be harmful to all concerned, and unless subsequent developments prove otherwise, I would oppose any such action.

Effect on Highway Work — In considering the use of organized labor on highway work, or in considering the right of labor to organize after a job is already under way, the first important question that enters a contractor's mind is: "Will I suffer increased costs if organized labor demands a higher wage scale or shorter working hours, or both." Quite naturally the contractor wonders what the responsibility of the contracting party is in this respect, whether the contract be with the government or with a certain designated highway department.

If, on the other hand, wage scales are increased before the bidding is done, and the scale remains as fixed, then it is not the contractor who suffers the loss, but the public which must either pay more for a stated amount of construction or get less construction for a stated sum of money. If the completion date on a highway project is delayed by labor and wage parleys and possibly strikes, then, also, the public suffers. I do not think that the general public objects to fair and reasonable wages. The public does not want any public construction done at starvation wages, and so far as the public is concerned, delay in the work may be a more serious threat than a moderate increase in cost due to fixing a fair wage scale. But of course, if wages become unreasonably high, it will greatly cut down the amount of work done and make it more difficult to get appropriations of public funds for highway construction. But with fair and intelligent leadership on the part of the labor unions, and reasonable tact and square dealing on the part of the contractors, wage scales may be worked out which are fair both to labor and to the public.

"It would appear to be better to cooperate fairly and intelligently with labor than to try to stem the tide."

Another factor that cannot be ignored is the labor racketeer. We have all heard of cases where unscrupulous men, through fair means or foul, have achieved positions as representatives of labor and have used their authority, not to help labor by fair and reasonable negotiations, but who serve merely their own selfish ends by stirring up strife and hatred and misunderstand-

ing. I think that these cases are not as numerous as many people believe, yet we must recognize that such a condition does, at times, exist, and that it is very difficult to deal with. But while these things are extremely aggravating, time usually takes care of them. Labor may be fooled temporarily by self-seeking persons, but no man can long continue as a labor leader unless he plays square with his own people.

Skilled Labor Shortage — There is one phase of the labor situation in which organized labor can be helpful to all concerned, and that is in the shortage of skilled labor. While this has not been felt in the highway industry as much as in some of the building trades, it will be more noticeable in the near future. During the years of depression many skilled artisans retired, died, or went into other lines of endeavor, and not a sufficient number of new men were trained to take their places. To supply the men needed for positions which require considerable skill and experience someone must see that a sufficient number of new men are trained. At the same time there should be some means to prevent too many men rushing into some branch of a trade where there happens to be a shortage. There are great possibilities for cooperation between contractors and organized labor in this field of training skilled workers.

"Whether we like it or not organized highway labor is a question we must face."

Day-Labor Menace — There is one other phase of the government's unemployment relief activities which should give contractors as much or perhaps more concern than the setting up of wage scales and other regulations governing working conditions, and that is the day-labor method of doing public work. The emergency employment work of CWA, WPA and the CCC camps, working in cooperation with local public works officials and state highway officials, has developed thousands of day-labor organizations. Each of these organizations will endeavor to perpetuate itself, and when federal expenditures are removed or decreased, there will be an effort to continue such organizations for the construction of local or state highways and other public works. Unless the construction industry is alert, there is danger not only that such work will be continued, but that it will be extended. While this type of work may be justified as a means of affording relief to the unemployed, it is not justified from any standpoint of public economy or efficiency. The public will suffer, but the construction industry must act as the spokesman in behalf of efficient methods of public works construction, which can be achieved only by the contract method. If labor is properly organized, it can cooperate very efficiently in this matter.

I do not believe that we should view with too much alarm these modern tendencies which are creeping into our particular line of endeavor. While the union labor movement, like every other organized effort, may be subject to abuses and may go wrong at times, its general results have been for the public good. Increasing wages or bettering working conditions does not necessarily injure those who must pay these wages, either the contractor who must pay them first hand, or the ultimate source of the funds, the taxpayer. Better wages always come back in better business, locally and nationally. Organized labor can be a great help in determining what are fair wages, and in so far as it helps to improve working conditions and living conditions, this can and should promote the general welfare. If we are to continue as one of America's largest and potentially powerful industries, we must do so with the spirit of fairness and cooperation in any movement that will ultimately be beneficial to the majority of those who labor, and lend our efforts to the end that such efforts on the part of labor, when properly organized and conducted, shall prove beneficial not only to ourselves and to labor, but to the taxpayer who eventually pays the freight.

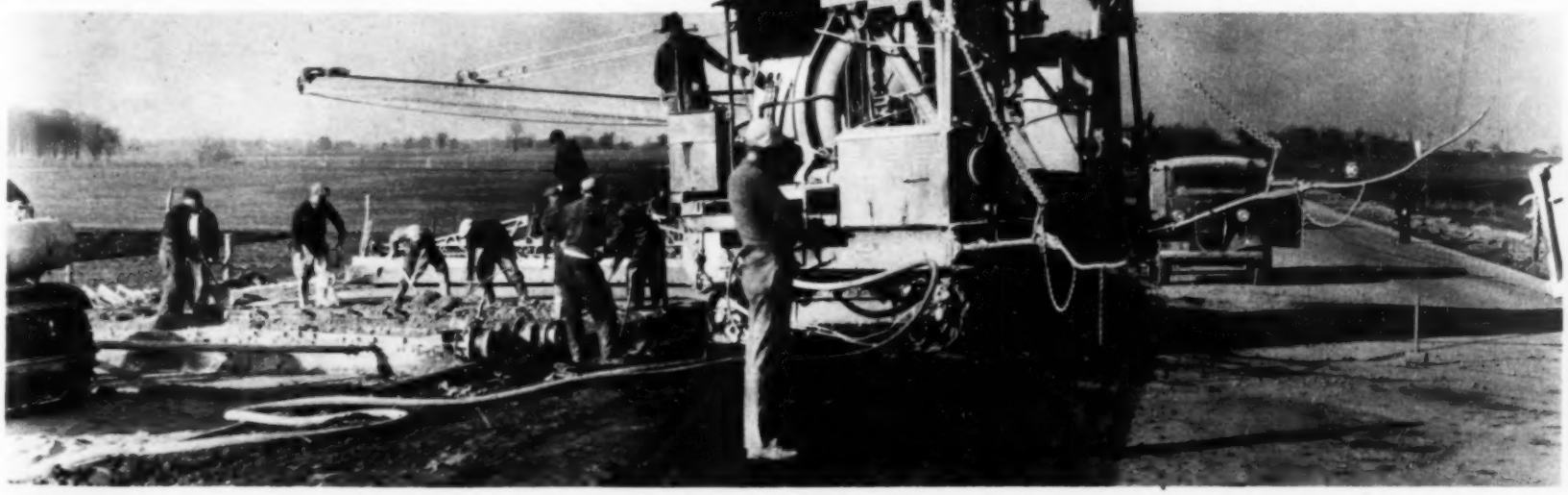
"Wage scales may be worked out which are fair both to labor and to the public."

UNIONIZE?

Excerpt from Report of Committee on Contract System vs. Day Labor, presented by Frederick Hoitt, chairman, at the recent annual convention of the American Road Builders' Association.

SUGGESTION has been made to this committee that the highway industry would not now be faced with the serious problem of governmental competition by day-labor if the industry were unionized. We are aware that more than 90 per cent of the industry has in the past been distinctly opposed to entering into agreements with organized labor. This opposition has not been without sound reasons. Back of the suggestion made to this committee that it might be well for the highway industry to give some present consideration to the question of unionization, is the thought that this industry, like others, must recognize present-day trends, should weigh conditions intelligently and as we find them, and make all indicated investigation into the question whether it is best for the future of the industry to revise past methods and practices in order to bring them into accord with the necessities of the present and the probabilities of the future.

IT IS but plain fact to state that organized labor possesses an influence and standing with law-making bodies and with administrative public officials that contractors are without. It is sensible to suppose that contractors and organized labor, acting together under agreeable, mutual understandings, would be in a position to accomplish much for the benefit of both, where either, acting alone, or with the other in opposition, might fail. As the suggestion was made to this committee, we present it as a question that we feel at least warrants investigation and consideration of the possibilities as bearing upon the subject matter of this report.



Cast Stone Facing

Functions as

Outside Form

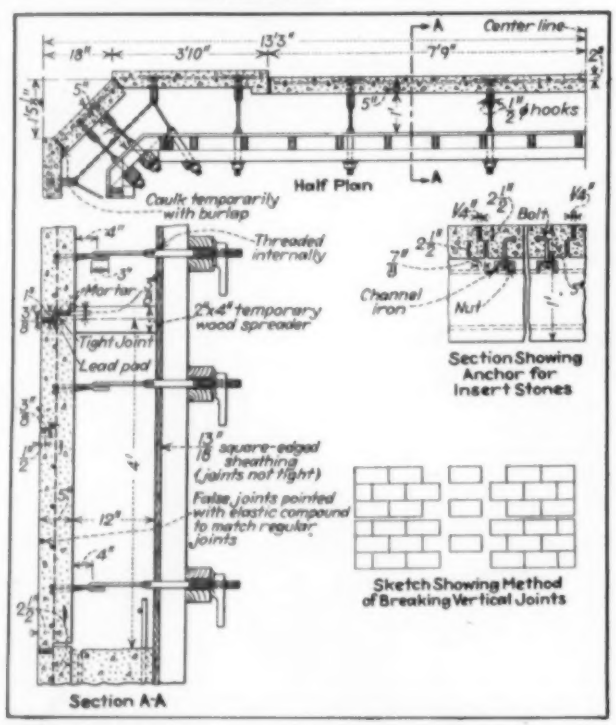
For Concrete Walls of Tall Shaft

Photo by Rittase

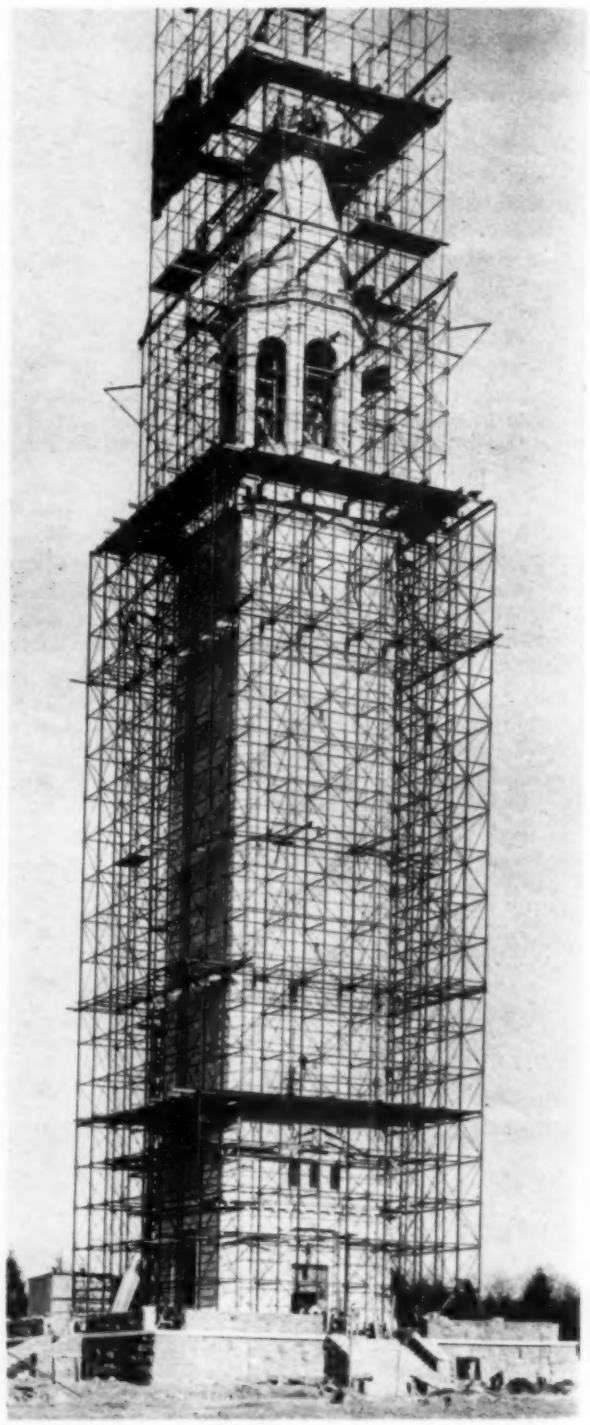
TALL CARILLON TOWER *(left)* **rising 215 ft. above ground has base course of white granite extending from terrace to first cornice. Above this point tower consists of reinforced-concrete shaft with cast stone facing, utilized during construction to retain monolithic wall concrete placed behind cast stone courses.**

FILLING A SECOND, temporary purpose during construction of the Nemours Carillon Tower on the estate of the late Alfred I. duPont, near Wilmington, Del., cast stone facing of the 215-ft. reinforced-concrete shaft served as the outside form for monolithic wall concrete placed in 4-ft. lifts behind individual stone courses by the contractors, Sauter & Schwertner, of Philadelphia. This method of construction produced some economies and furnished a stronger anchorage between the stone and the concrete walls than could have been obtained by the conventional practice of setting the stone after the walls had been concreted. Tubular steel scaffolding rising ahead of the tower provided a working platform and storage space surrounding the structure. A tubular steel elevator hoisted materials, while two Chicago booms resting on diagonally opposite corners of the interior of the scaffolding set facing stone and form panels. The Chicago booms moved up as the work progressed.

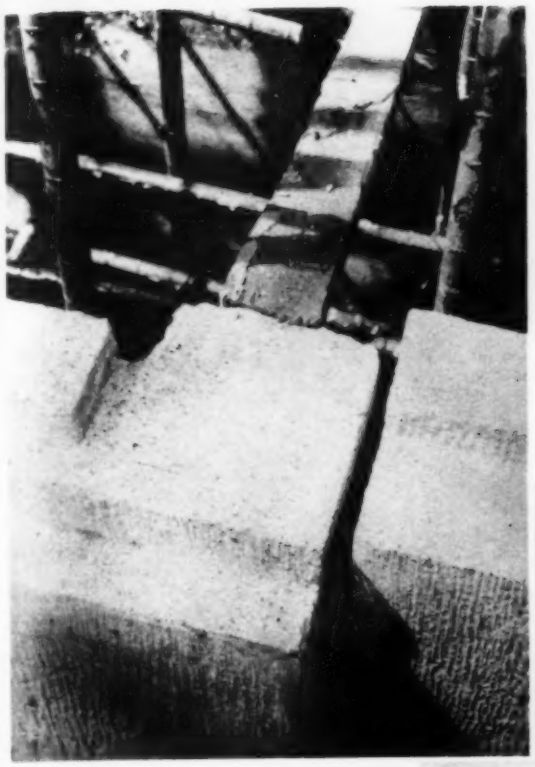
Carillon Tower — Exterior details of the Nemours Carillon Tower, designed by Massena & du Pont, architects, of Wilmington, are revealed by an accompanying photograph. Rising from a terrace 7 ft. above grade the tower consists of a shaft 26½ ft. square at terrace level tapering to 25 ft. 10 in. square at an observation balcony, about 120 ft. above the terrace. Up to the first cornice, about 19 ft. above the terrace, the base of the tower is faced with Concord white granite. Above this cornice the facing is cast stone, the recessed central panels of the shaft being pink and the corner quoins light gray. The light gray cast stone resembles the natural granite of the base course so closely that from the terrace level it is virtually impossible to detect the change



CAST STONE PANELS are anchored to inner forms by threaded ties hooked to loops of ½-in. round rod. Insert stones alongside windows are bolted to steel channels. These channels are anchored to inner wood form by threaded rods hooked to brackets welded on webs of channels.

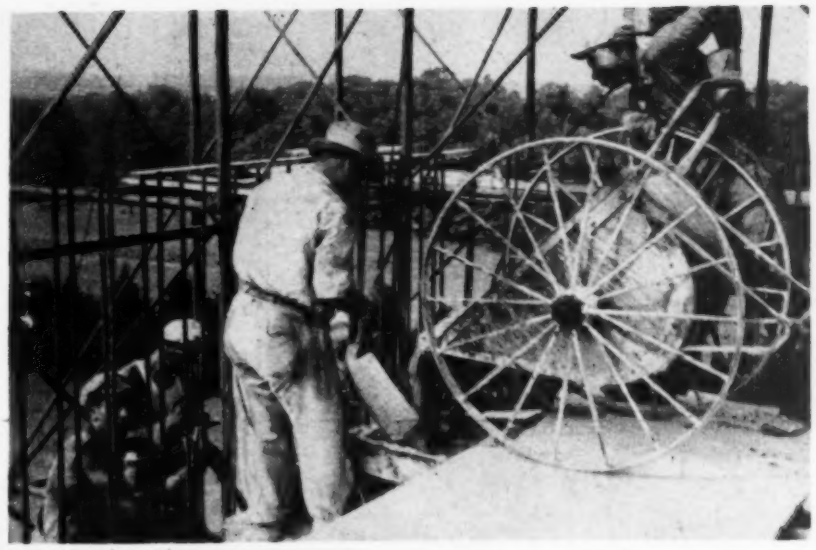


SPIRE above bell chamber is erected by same method as shaft, facing stone being used as outer form for reinforced concrete and tubular scaffolding being carried up some distance above construction level.



SHOULDER *(left)* of horizontal joint guides setting of next stone course and keeps exterior faces flush.

CONCRETE *(right)* delivered to upper level in hand cart is dumped into metal chute for placing in wall forms.

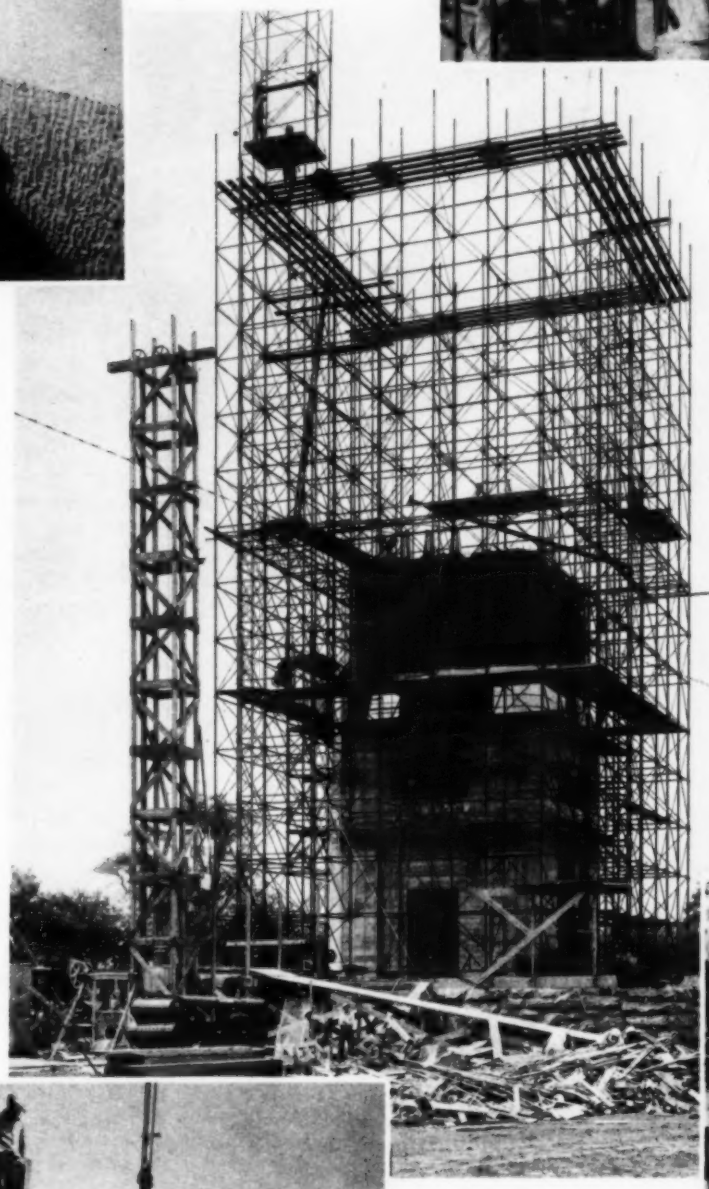


in materials. All cast stone has a bush hammered finish.

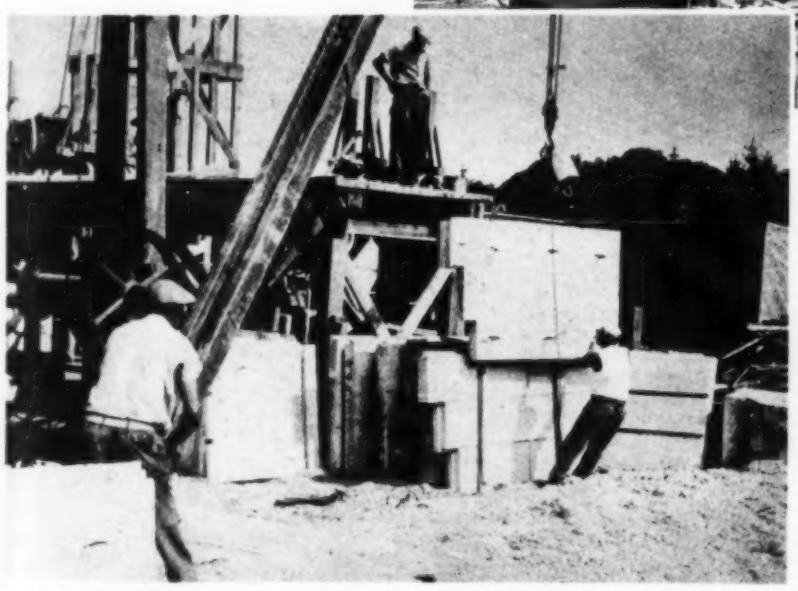
An elevator inside the tower operates from the lobby floor below the terrace to the observatory floor just under the bell chamber. Between these two levels, the interior of the shaft is provided with intermediate floors at typical story heights of 19 ft. 1½ in.

Erection Procedure—Wood sheathed inner forms for an entire story were erected in advance of stone setting. Both sectional panel forms and loose-board forms built in place were used alternately in the wall construction without any definite advantage in economy being shown by either type. After the inner forms had been erected, stone was set and monolithic concrete placed one course at a time, the concrete being delivered by closed chute from the floor above through openings in the wood inner forms. Each stone course was set by the two Chicago booms, and the slabs of cast stone were tied to the wales of the inner forms by threaded rods hooked to loops cast in the stone at the time of manufacture. Narrow cracks were left between the boards of the inner forms to permit escape of excess water. The floor slab was placed with the final course of each story.

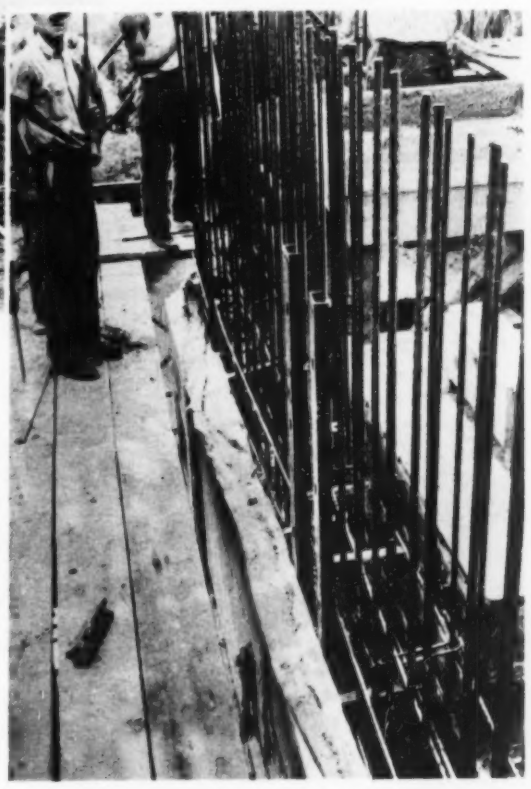
Cast Stone—Stone courses 4 ft. high were made up of units 8 ft. long and generally 5 in. thick, weighing 1,800 lb. The cast stone simulated coursed ashlar in units 16x36 in., with false joints for three courses in each cast slab. To eliminate straight vertical joints between adjacent slabs, the units were joined as shown in the accompanying drawing. The cast stone units were designed as vertical slabs rein-

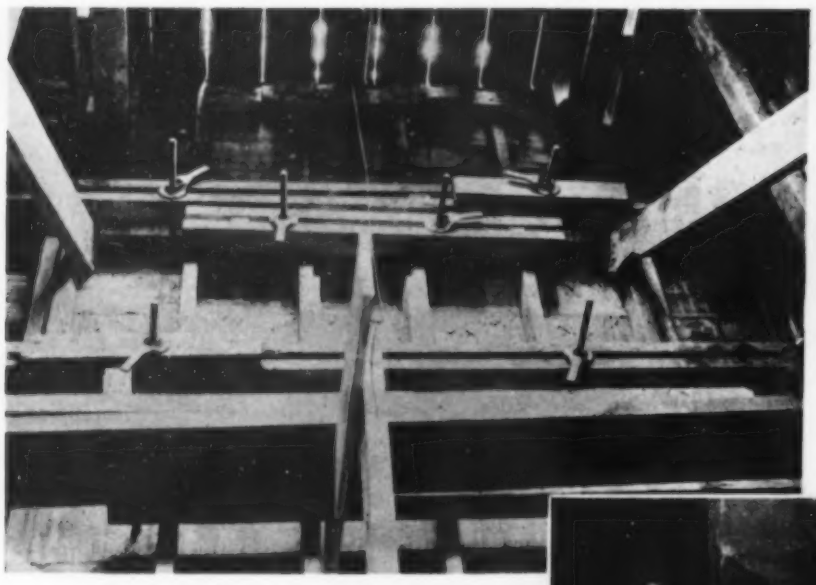


TUBULAR STEEL SCAFFOLDING *(right)* around shaft carries working platforms. Two Chicago booms resting on interior scaffolding set stone. Tubular-tower elevator raises cast stone and concrete to construction level. Mixer is placed at base of wood tower at left. Inner wood forms have been erected for one story height, and first lift of cast stone is being set.

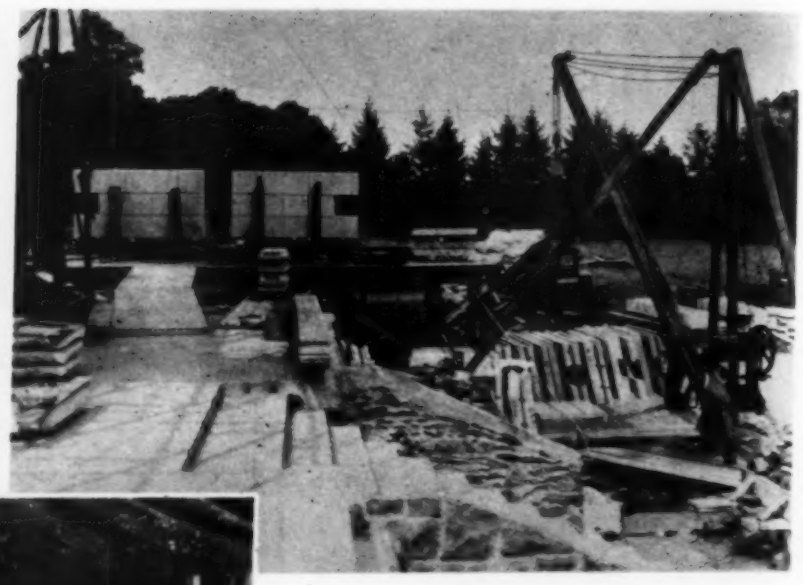


STEPPED SLABS *(left)* are used to stagger vertical joints at sides of tower windows. To fill small gaps remaining alongside windows, insert stones are anchored to channel irons *(right)* by bolts cast in stone units.





FORM CLAMPS bearing against wales of inner form draw cast stone slabs against shoulder at lower horizontal joint and against temporary wooden spreaders at top.



CAST STONE SLABS are placed in vertical position on hand trucks for movement on and off hoist platform in tubular tower.

GASOLINE HOISTS operate platform elevators in wood and tubular steel towers.

forced to withstand a 4-ft. depth of concrete placed in 1 hr.

An accurately dressed shoulder at the horizontal joint helped to keep exterior faces of successive stone courses flush and in alignment. This joint was spaced with lead pads. Form clamps drew the stone slabs tight against the shoulder at the bottom and against temporary wood spreaders at the top.

Vertical joints were caulked with burlap from the outside, and no attempt was made to place mortar in these joints during setting. After the concrete had hardened the burlap was removed and a stiff mortar was tamped into any joints which had not been filled with grout from the concrete. When construction had been completed, all joints were pointed to a depth of 1 in. with an elastic compound.

Quantities and Equipment — Construction of the tower required 12,000 cu.ft. of cast stone, 3,200 cu.ft. of Concord white granite, 1,300 cu.yd. of concrete and 180,000 lb. of reinforcing steel. The concrete mixture used with each sack of cement 165 lb. of crushed Brandywine granite and 170.6 lb. of damp sand. Water was added in the amount of 6¼ gal. per sack, including moisture in the aggregate, producing a slump of about 6 in.

Wall concrete was spaded but was not vibrated. Required strength at 28 days was 3,000 lb. per square inch. The average strength of test cylinders at this age was about 4,500 lb. Concrete was mixed by a Ransome 14-S mixer and was raised to a hopper on a wood elevator tower by a gasoline hoist engine.

A second gasoline hoist engine operated the elevator in the tubular steel tower which delivered carts of concrete and trucks of stone to the upper levels. Hand winches on the floor of the shaft immediately below the stone setters operated the two Chicago booms. Tubular scaffolding used in erecting the tower had served previously in cleaning the Washington Monument, Washington, D. C.

Progress — Five courses, constituting one story of the tower, ordinarily were completed in eleven working days, four of which were consumed in building interior forms and seven in setting stone and placing concrete in walls and floor. Frequently the construction force set a stone course and concreted the wall behind it in one day.

Concrete columns of the bell chamber were cast before the stone veneer was placed, but in constructing the spire above the bell chamber the contractor, because of the great success obtained with the method on the main shaft, returned to the practice of setting facing stone first and using it as the outside form for the concrete.

Personnel — Construction of the Nemours Carillon Tower was directed for Sauter & Schwertner, the contractors, by Charles H. Schwertner, with Harry W. Cornelius, superintendent, in charge at the site. Massena & du Pont, Inc., were the architects.

HEAVY PLANER

Removes High Spots from Concrete Pavement

10-FT. SCRAPER *(below)* planes Oregon concrete pavement after average curing period of 17 hr. to bring surface variations within limits of exacting specification. Three men ordinarily are required to pull scraper. CUTTING BLADES *(left)* are bolted to steel angle mounted on two sets of rubber-tired wheels.

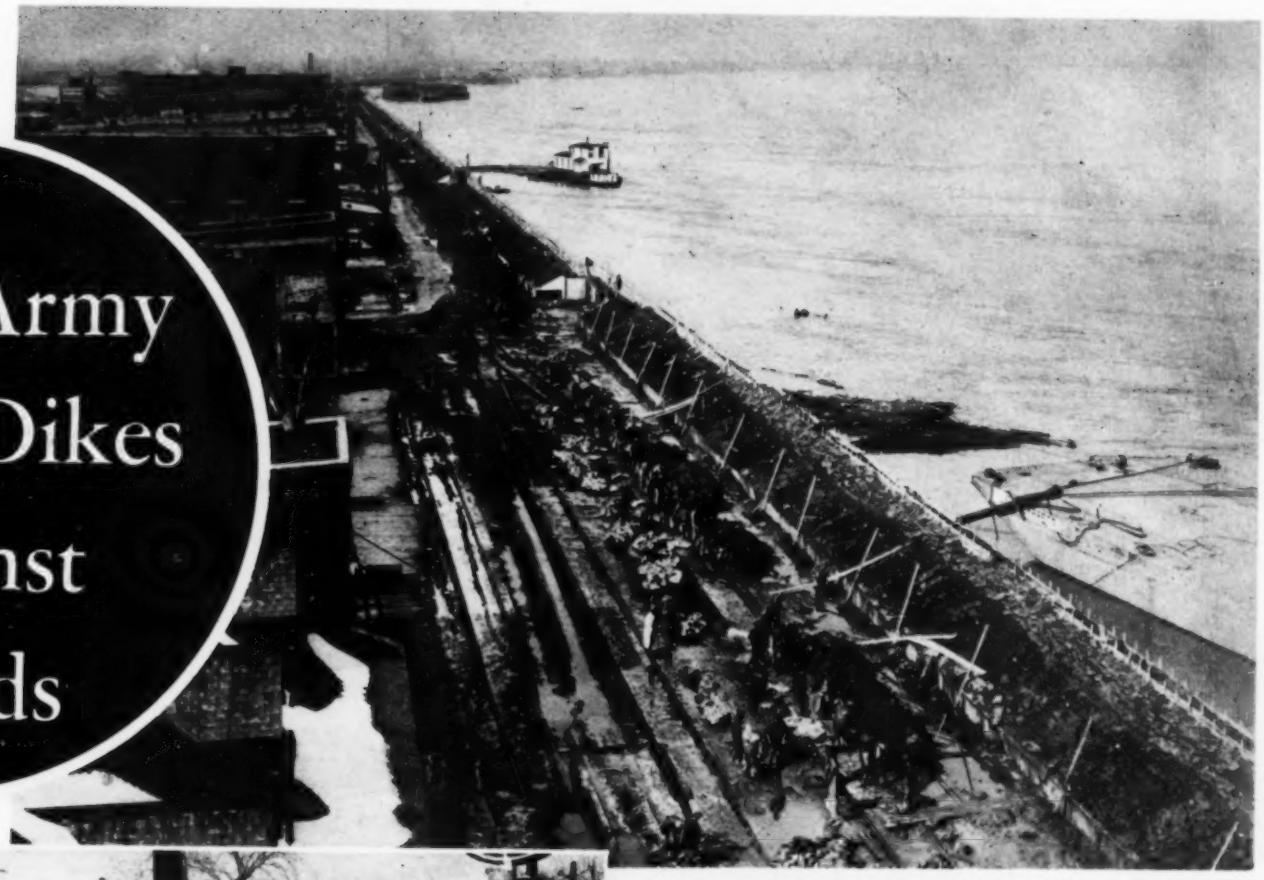
OREGON SPECIFICATIONS for concrete paving provide that no surface variation shall exceed 0.07 ft. in 10 ft. As one means of meeting this specification contractors have become proficient in the use of a special scraper, or planer, introduced in 1931 and now required only in exceptional cases, according to H. G. Smith, construction engineer, Oregon State Highway Commission. The scraper is used ordinarily on the day following placement of the concrete and is drawn across the pavement transversely to remove high spots marked in advance.

Weighing about 240 lb., the scraper consists of a 5x5x⅜-in. steel angle 10 ft. long to which two ⅜x3-in. by 5-ft. cutting blades are bolted. Bolt holes in the blades are slotted to permit adjustment of the cutting edges, and the handle for pulling the scraper also can be adjusted to raise or lower the angle of the blades. Stellite is welded to two surfaces of the blades, making four edges available for cutting.

After curing for 10 to 24 hr., the pavement is tested before planing. When concrete has aged sufficiently, the planer trims high spots without raveling.

River Army Raises Dikes Against Floods

Photos by Army

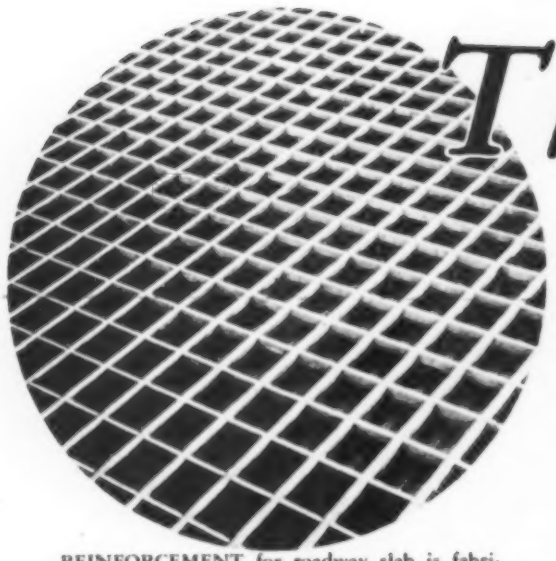


BESEIGED BY RISING RIVER, Cairo, Ill., increases height of concrete flood wall by adding 3-ft. clay-filled wood-box parapet reinforced by piled sandbags. In foreground men fill sandbags with material brought in by railroad cars. Boats remain tied up to wall to take off force of 2,500 levee laborers and other people remaining in town in case river breaks through dike.

PONTOON BRIDGE *(left)* hastily constructed with barrel floats carries pedestrians along flooded street in Louisville, Ky.

ADDED BULKHEAD *(above)* on top of concrete flood wall at Cairo, Ill., is designed to restrain Ohio River waters when flood and wind carry them above concrete structure. Cairo, situated on narrow neck of land between Ohio and Mississippi at junction of two rivers, experiences long, tense fight with unprecedented winter flood during which Ohio reaches discharge peak of 2,100,000 sec.-ft. as compared with previous maximum of 1,600,000 sec.-ft. in 1913

WHEEL SCRAPER drawn by team of mules carries earth fill into box-type bulkhead being built on levee near Memphis to keep Mississippi River from intruding upon offices and shops of U. S. Engineers' depot.



REINFORCEMENT for roadway slab is fabricated in mats of 3½-in. I-beams tied into grid by locking bars.

Thin ARMORED SLABS

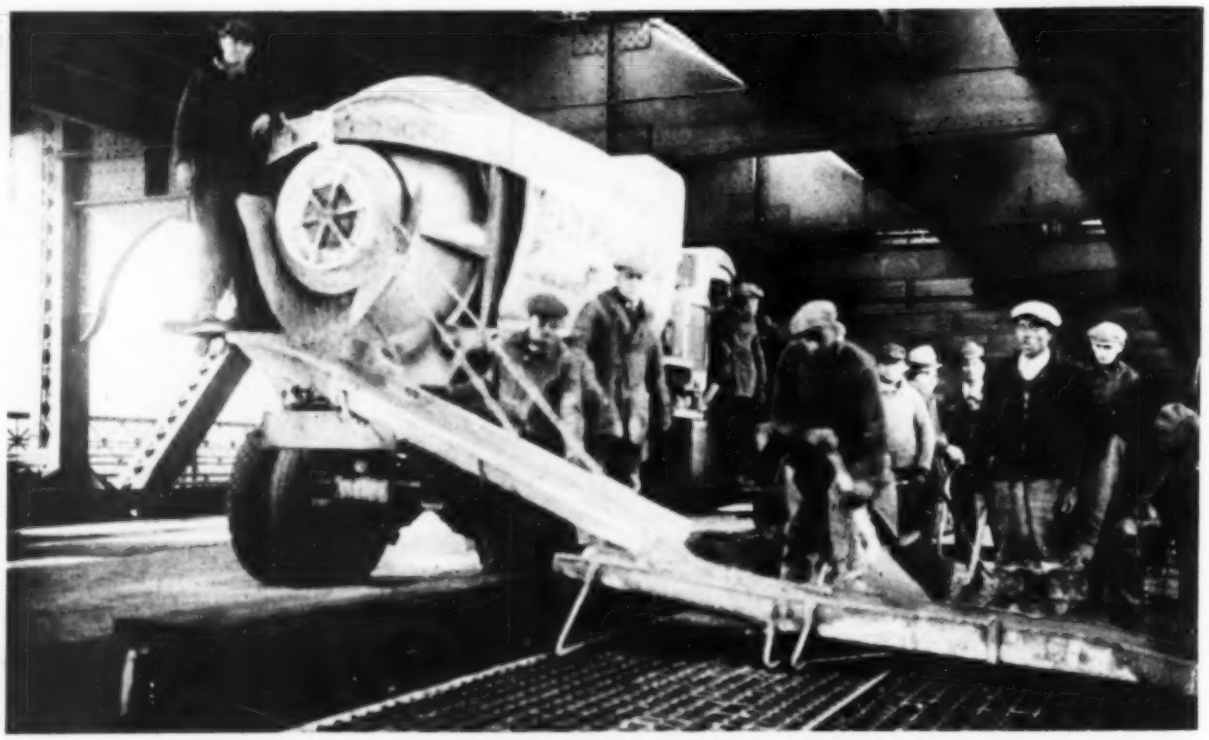
Form Concrete Roadway for Cantilever Spans of Queensboro Bridge

Two types of reinforced concrete slab are used in this program of modernizing 5,960 lin.ft. of bridge roadway 54½ ft. wide on approaches and 51 ft. wide on main river spans: The first, installed on the approach and anchor arm spans of the structure, where weight reduction is not of prime importance, called for a slab thickness of 7¾ in., reinforced with welded steel bar-truss mats and weighing 108 lb. per square foot. On the cantilever spans, however, it was necessary to reduce dead weight to a minimum by using a slab thickness of only 3½ in., reinforced with Carnegie-Illinois I-Beam Lok units and weighing 61.2 lb. per square foot. The new deck is built in lanes 10 ft. wide (three inner lanes) and 10 ft. 5 in. wide (two outer lanes).

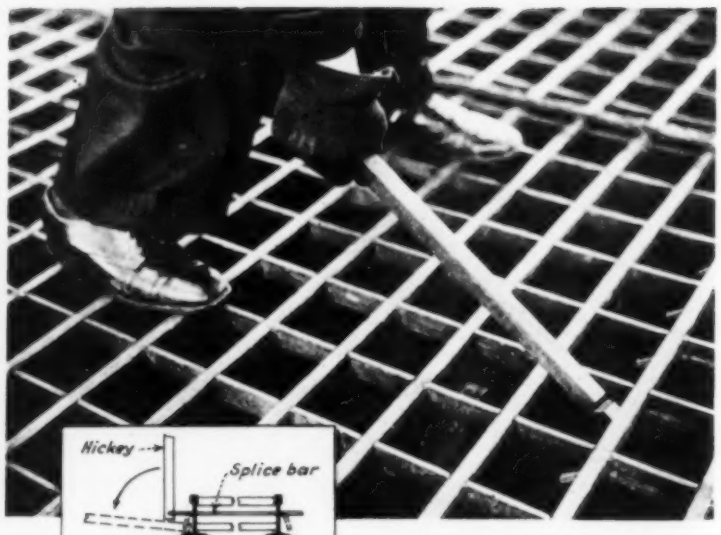
On the bridge stringers, after the old floor system had been flame-cut and removed from the cantilever spans, were placed 4 ft. x 9 ft. 11½-in. built-up re-

"WE'RE MAKING the first pour of concrete on the roadway of the cantilever span this morning. Come on up and see it. It's different from the job you described in your issue last September."

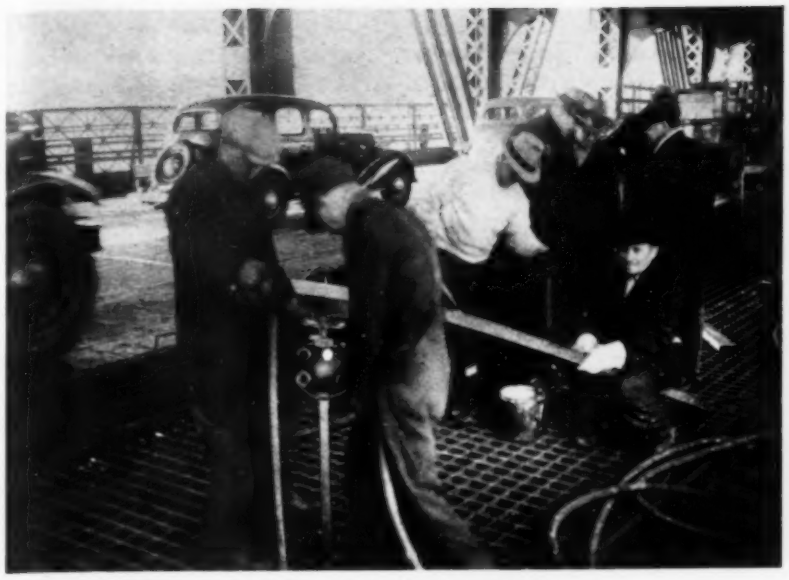
That was the message *Construction Methods and Equipment* received by phone from S. Hamburger, engineer in charge of the Queensboro bridge, which is having its old wood block pavement on steel buckle-plate deck replaced with a modern 5-lane reinforced concrete roadway to carry over the East River, New York City, traffic reaching the huge total of 109,000 vehicles in 24 hr. The work is a WPA project and is being done under the direction of the city's Department of Plant and Structures.



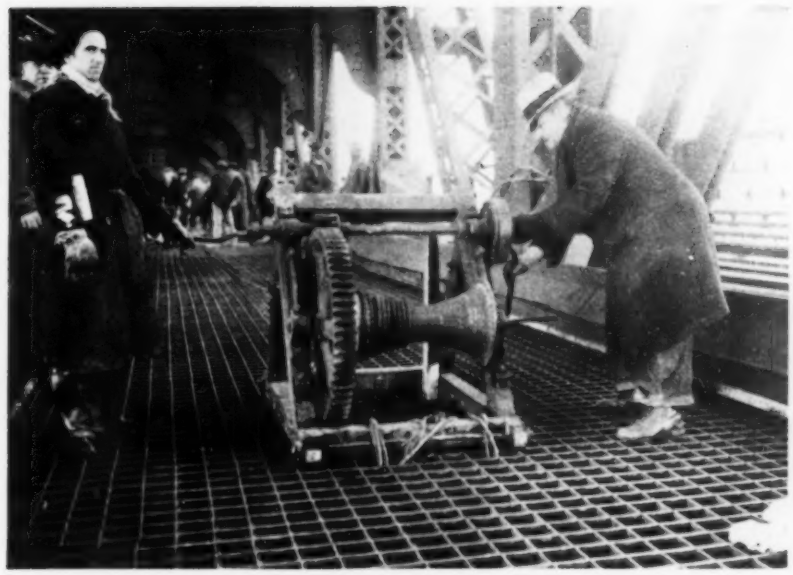
FROM TRUCK MIXERS *(right)* 4½-cu.yd. batches of concrete are chuted to place, spread by hand and vibrated. SECTIONAL CHUTES *(below)* permit discharge of concrete at points desired.



JUNCTION between reinforcing mat units is made by bending down with "hickey", notched at lower end, short splice bars extending through holes punched in I-beam webs.



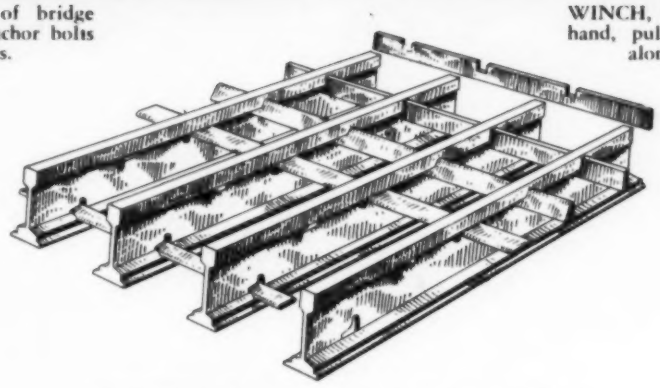
HOLES are drilled through flanges of bridge stringers, where necessary, to receive anchor bolts for tying down reinforcing units.



WINCH, tied to bridge girder and operated by hand, pulls cable which hauls vibrating screed along freshly concreted roadway slab.

inforcing units of steel I-beams 3½ in. deep, with 3/16-in. webs, spaced 4 in. on centers and tied and locked together by notched cross bars, extending through and welded into openings punched in top and bottom of the steel I-beam webs. The mats are set with the I-beams extending across the line of traffic. These mats are anchored to the flanges of the steel bridge stringers by vertical bolt and angle connections. The horizontal leg of the angle iron anchor passes over a tie bar of the reinforcing mat and is punched to receive a ¾-in. bolt which extends down through a former rivet hole in the top flange of the bridge stringer. By turning up a nut on the upper end of the bolt the mat is tightly clamped to the bridge steel.

Originally the intention was to join successive reinforcing mat units by welding their ends together, but a change was made by eliminating the welded joints and forming connections between ends of mats by means of 5/16-in. square steel splice bars, 16 in.



ASSEMBLY of 3½-in. I-beam mat units, showing how upper and lower locking bars are inserted in web slots and rotated to vertical position for spot welding.

long, extending through holes in the webs of the 3½-in. I-beams of adjoining units. These splice bars are bent over at each end by a hand-operated "hickey" or steel rod, notched at its lower end to engage the 5/16-in. steel splice bars and turn their projecting ends down at a sharp angle. "This change," explained Mr. Hamburger, "saved us a good many thousands of welds."

Ordinarily the I-Beam Lok units are provided along their bottoms, with thin metal "form strips" to retain the concrete poured around the reinforcement and eliminate the setting of forms. On the Queensboro bridge, however, these strips were omitted and ⅝-in. plywood form panels were set under the reinforcing mats and braced from the bridge stringers by 2x4-in. inclined wood struts. It was thus possible, when forms were struck, to make a careful inspection of the concrete forming the under side of the slab. This inspection was considered important, as the concrete must set up on a structure subjected to constant vibration from passing traffic and its quality must be assured beyond any doubt.

Concreting methods were essentially the same as those described in the previous article on the approach and anchor arm roadways. The concrete was a 1:1½:3¼ mix, using ¾-in. trap rock and Incor high-early-strength cement. The slump was 6 in., using 150 gal. of water per 33 bags of cement. In 4½-yd. batches concrete was chuted to place from truck mixers, spread by hand shoveling with WPA labor and thoroughly rodded to fill the spaces between the reinforcing members of the mats. A heavy steel screed, equipped with a pair of Munsell vibrating units, was then dragged along the concrete surface by a cable from a hand winch. Curing was done by the Hunt process, by spraying a bituminous film upon the surface of the concrete.

Traffic lanes are separated by built-in strips of white cement. All work was done without interrupting traffic.

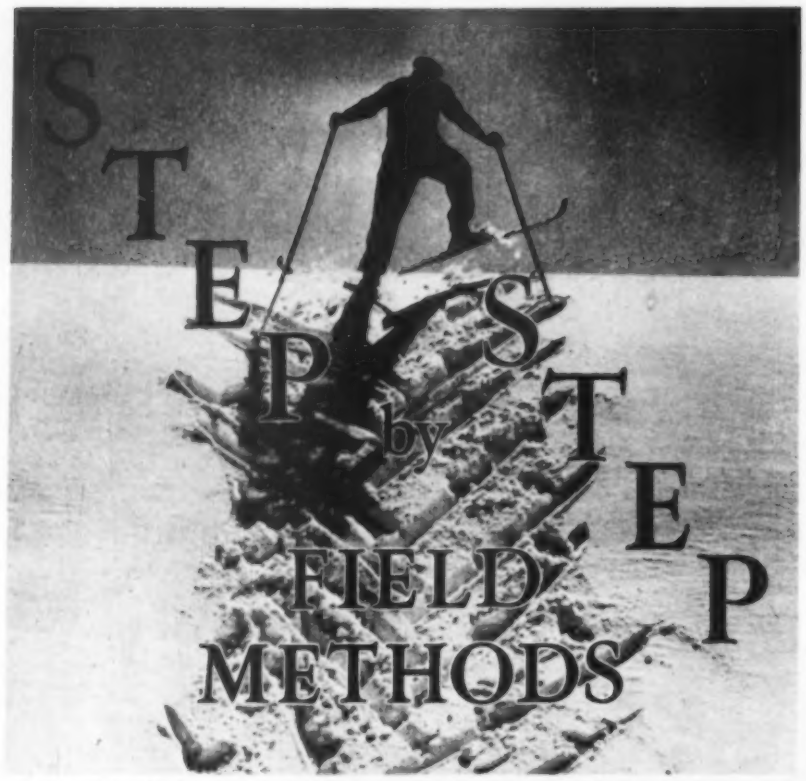
30-Ft. Finisher Strikes Off Tar-Slag Road

A TWO-COURSE SLAG ROAD 30 ft. wide with a 2-in. mixed-in-place, tar-bound surface course was constructed and struck off to full width near Youngstown, Ohio, by a self-propelled Flex-Plane finishing machine riding on Heltzel steel road forms. Built as a WPA project by the Mahoning County Highway Commission under the direction of George Montgomery, county engineer, the work involved about 2.6 mi. of 30-ft. road with total thickness of 10 in.

Six trucks hauled base material to the road and dumped it in front of the finishing machine, which struck it

off to the proper depth. A distributor applied tar to the base prior to blading with a grader. After a second tar application the finishing machine again struck off the base. Following completion of the base the top course was laid and struck off by the finishing machine.

Construction of the three lanes simultaneously avoided overlapping or faulty blending where the lanes meet. Use of a finishing machine to strike off the slag assured proper depth and cross-section of the pavement. After the black-top paving had been completed, a 2-ft. concrete gutter was constructed along each edge.



Building a $5,000 Steel House

STEEL PANELS fabricated in the shop and assembled at the site make up the walls and roof of a one-story house erected by the Insulated Steel Construction Co., Middletown, Ohio, for the Purdue University housing research project, Lafayette, Ind. Lacking a cellar or any other storage room and containing 940 sq.ft. of usable inclosed floor area plus about 240 sq.ft. in heater room and attached garage, the house was built for a contract price of $4,992. Efficient design provides a convenient layout for a small family in a house having concrete foundation walls and sub-floor, hardwood or linoleum finish flooring, insulated steel walls painted inside and out, and a cellular steel roof insulated on the top and painted on the ceiling surface. The house contains three bedrooms of average size in addition to a living room with dining alcove, kitchen and bathroom.

According to a report prepared by C. Paul Ulmer and published in Purdue's *Home Information*, the record of costs on the project shows too small a margin for the general contractor's overhead and profit. Complete tables of labor and material costs are given in the section immediately following these notes.

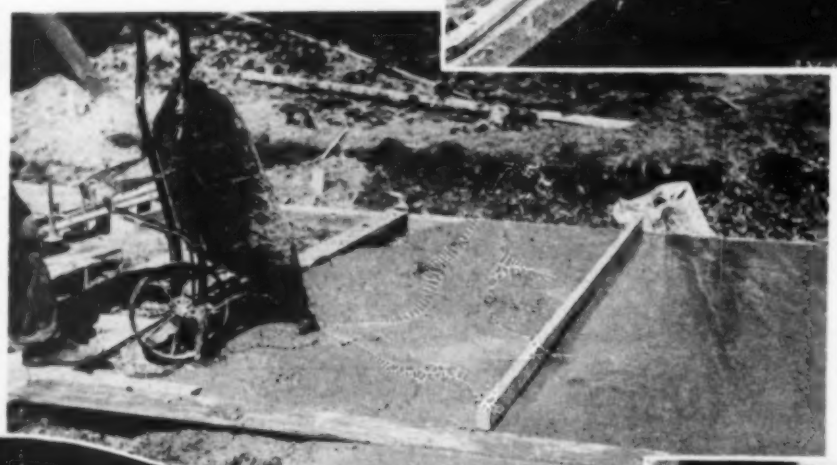
Steel Panels — Structural rigidity in the house is provided by the wall and roof panels which were fabricated with integral studs or webs to furnish necessary stiffness. Wall panels were made 3 in. deep, with two sides of 20-gage steel plate welded to the flanges of light pressed steel channels running vertically. The wall panels varied in width but extended full height from sill to coping. They were closed on the four edges and the space between the plates was filled with loose mica insulation.

Roof panels are composed of Z-shaped sections of 20-gage steel plate spot welded together at the shop to form panels about 2 ft. wide and equal in length to the span. Webs of the panels are 6 in. deep, spaced 8 in. c. to c.

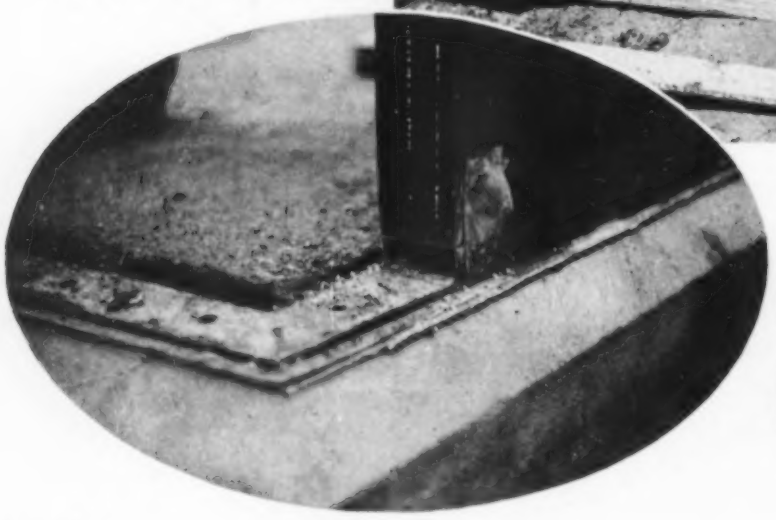
House Plan — Aside from the compactness and efficiency of the room layout, the plan is noteworthy in two respects. As shown by a sketch accompanying the cost data, an alcove of the garage formed by the rear entry is utilized as a laundry equipped with portable trays. By heating the house with a gas-fired forced warm-air system, the heating plant is compressed into a space 3½x6¾ ft. A gas-fired hot-water tank is placed in the same area.

To lend spaciousness to the living room, the ceiling height is made 9 ft. 9 in., as compared with 8 ft. in the remainder of the house. This increase in ceiling height provides a break in the flat-roofed exterior.

1 CONCRETE FOUNDATION WALLS *(right)* 8 in. thick are built between forms, and anchor bolts for steel wall panels are set in top of concrete wall. Rough plumbing is installed in trenches before fill and concrete floor slab are placed.



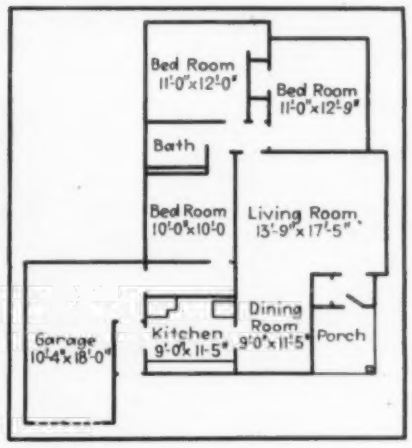
2 AFTER COMPLETING FOUNDATIONS and rough plumbing *(right)* construction force places concrete floor slab on cinder fill.



3 FLAT STEEL SILL *(left)* anchored by bolts to top of foundation wall has raised section over which steel wall panels fit. Accurate lining and leveling of sill assures close fit of panels.

4 SELF-TAPPING FLAT-HEAD SCREWS *(below)* driven through overlapping flanges of adjacent steel panels fasten wall sections together. Holes for screws are drilled with electric drill.

5 **STEEL WALL PANELS** *(left)* **are raised by hand without use of erection equipment. Panels extend from foundation wall to roof or top of parapet.**

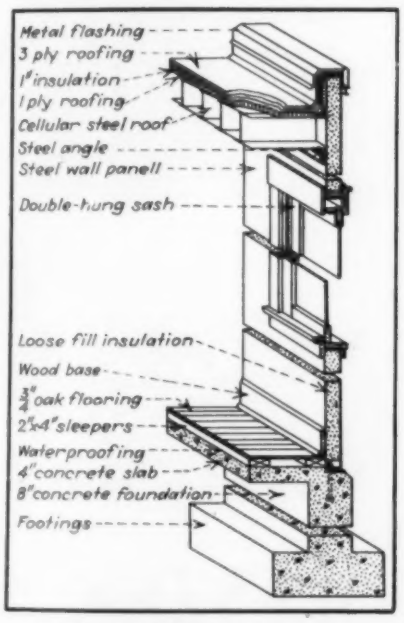


FLOOR PLAN of insulated steel-shell house erected at Purdue for total contract cost slightly less than $5,000.

Foundation Work — Plain concrete footings 8 in. deep and 20 in. wide were placed without forms in trenches cut to proper width at an average depth of 36 in. On top of the footings the contractor built concrete foundation walls 8 in. thick between wood forms made up in sections of 1x8-in. boards on 2x4-in. studs.

Floor Construction — Concrete floor slab 4 in. thick was placed directly over earth and cinder fill which was tamped but not puddled. The entire floor (except the porch, garage and heater room) was damp-proofed with a coat of asphalt emulsion. Garage, heater room and porch were given a troweled cement topping integral with the slab. As a base for wood flooring 2x4-in. sleepers were spiked to the concrete slab on 16-in. centers.

In the kitchen, rear entry and bathroom No. 2 yellow pine 1x6-in. flooring was laid over the sleepers as a base for standard gage linoleum. Select oak flooring ¾x2¼-in. nailed to



TYPICAL SECTION shows construction of foundation, floor, wall and roof. Window frames fit into openings in steel wall panels, which extend above level of flat roof to form parapet.

6 **TWO MEN** *(left)* **set steel panel without difficulty. Panels are shop-fabricated of 20-gage steel sheets welded to two sides of pressed structural channels, with 3-in. space between sheets filled with insulating material. Edges of panels are closed.**

7 **COARSE-MESH FABRIC RIBBON** *(right)* **applied with brush coats of sizing to joint between panels seals joint and prevents cracking of paint at this point.**

8 **TO CARRY ROOF PANELS** *(right)* **workmen attach 1¾ x1¾-in. shelf angle to steel wall panels. Portion of wall extending above roof forms parapet.**

9 **INSULATION** *(left)* **on cellular steel roof consists of 1-in. fiber board placed on layer of felt and asphalt. Fiber board is covered with three-ply built-up roofing.**

10 **HARDWOOD FLOORING** *(right)* **is laid on creosoted 2x4-in. sleepers secured to concrete floor slab 16 in. on centers.**

the sleepers was used throughout the remainder of the house.

Erecting Wall Panels — Prefabricated wall panels were of a size and weight to permit handling and raising by two men. When raised into position, each panel was anchored to the sill by means of anchor bolts, 145 of which were set in the concrete.

Roof Construction — Roof panels were supported on the outside walls by 1¾x1¾-in. shelf angles fastened to the wall panels. Fiber insulation boards 1 in. thick and 22x47 in. in area were laid with staggered joints

11

COPING FLASHING *(left)* consisting of 26-gage galvanized iron formed to cap top of wall is soldered at joints.

12

PLASTIC PAINT *(below)* applied in two coats with wide brush and stippled gives appearance of painted plaster surface.

over the roof and up the inside of the parapet to the coping. Before laying the insulating board, the steel roof was given a primer coat of cut-back asphalt covered with one thickness of 15 lb. per square asphalted felt mopped with hot asphalt. On the insulation board were placed two layers of 15-lb. felt and a final layer of 75 lb. per square gravel surfaced felt, each layer laid in a mopped-on coat of hot asphalt. All roofing was carried up the inside of the parapet and over the top of the wall, which was covered with 26-gage galvanized iron flashing.

13 **STEEL WALLS AND ROOF made up of prefabricated panels are outstanding feature of Purdue University house, containing five rooms and garage, with gross floor area of 1,262 sq.ft., built for contract price of $4,992. House has no cellar. Exterior walls are finished with three coats of cement paint, using color and sand in third coat.**

Table I . . . Construction Cost and Man-Hour Summary

DIVISION OF WORK	SUB-DIVISION	SPECIFIC JOB	TOTAL MAN-HOURS	LABOR	MATERIAL	LABOR AND MATERIAL	PROFIT AND OVERHEAD	JOB COST	SUB-TOTAL	TOTAL COST	PERCENT OF COST
EXCAVATION			60½	$ 29.45	$	$ 29.45	$ 7.75	$	$	$ 37.20	0.74
BACKFILL			15	6.30		6.30	1.65			7.95	0.16
FOUNDATION	Footings	Concrete	19¼	11.45	25.40	36.85	9.75		46.60		
	Walls	Forms	109	69.75	79.70	149.45	39.40	188.85			
		Concrete	52	32.75	70.15	102.90	27.20	130.10	318.95	365.55	7.31
FLOOR	Fill		15½	6.20		6.20	1.65		7.85		
	Concrete	Slab	39½	24.50	93.60	118.10	31.20		149.30		
	Dampproofing		5	2.00	7.30	9.30			9.30		
	Flooring	Sub-Floor	5	4.50	6.30	10.80		10.80			
		Sleepers			24.90	24.90		24.90			
		Hardwood	66	59.40	77.50	136.90		136.90			
		Linoleum	5	3.75	20.00	23.75	6.25	30.00			
	Cleanup		12	4.80		4.80		4.80	207.40	373.85	7.48
WALLS	Sills		42	34.65	4.60	39.25	5.10		44.35		
	Steel Panels	Wall	399½	218.55	932.30	1150.85	*		1150.85	1195.20	23.94
ROOF	Steel Panels	Roof	126½	71.35	429.70	501.05	*		501.05		
	Insulation		46	24.30	65.75	90.05	6.00		96.05		
	Roofing		20½	10.40	73.00	83.40	5.55		88.95	686.05	13.72
METAL WORK	Coping Flashing		34	20.65							
	Gutters & Downspouts, etc.		24	17.25	91.90	129.80	*			129.80	2.60
MILLWORK	Windows, Doors, Hardware & Trim		182½	162.75	431.80	594.55	*		594.55		
	Cabinets		37	33.30	34.70	68.00			68.00		
	Screens		13	11.70	29.65	41.35			41.35	703.90	14.17
HEATING	Flue		15½	13.40	17.95	31.35	8.25		39.60		
	Furnace & Ducts		41	46.15	283.85	330.00	*		330.00		
	Furring		18½	16.65	4.70	21.35			21.35	390.95	7.82
PLUMBING	Rough	Excavation	10½	5.15		5.15	1.25	6.40			
		Sewer & Soil	21	18.70	79.25	97.95	23.50	121.45			
		Water & Gas	20	17.00	27.60	44.60	10.65	55.25	183.10		
	Fixtures		53	43.25	131.50	174.75	33.15		207.90	391.00	7.82
ELECTRICAL	Rough	Conduits	4½	4.50	7.10	11.60	.65	12.25			
		Cable	26½	26.50	16.00	42.50	2.35	44.85			
		Outlets & Boxes	13	13.00	3.55	16.55	.95	17.50	74.60		
	Finish		20½	18.50	29.15	47.65	2.75		50.40	125.00	2.50
PAINTING	Exterior	Walls	67	31.70	69.85	101.55	2.45		104.00		
	Interior	Walls & Ceilings	115½	64.50	51.60	116.10	2.80	118.90			
		Closets & Garage	28	14.00	6.00	20.00	.50	20.50	139.40		
	Floors		31½	15.75	7.65	23.40	.55		23.95		
	Exterior Trim		44½	22.25	11.85	34.10	.85		34.95		
	Interior Trim		79	39.50	18.00	57.50	1.40		58.90		
	Clean Up		1½	.75		.75			.75	361.95	7.24
TOTAL			1939¾	$1271.00	$3263.85	$4534.85	$ 233.55			$4768.40	
General Contractor's Overhead and/or Profit										$ 223.80	4.50
GRAND TOTAL AND CONTRACT PRICE										$4992.20	100.0

* Overhead and profit included in material cost.

Cost Analysis of $5,000 Steel House

DETAILED RECORDS of all costs entering into the construction of the insulated steel house of the Purdue Housing research project, made available in the report of C. Paul Ulmer, technical assistant, furnish a useful gage of the man-hours of work by various trades required in the erection of this type of dwelling. To facilitate analysis of the cost records, *CONSTRUCTION Methods and Equipment* has further broken down the labor items into the man-hours of each class of labor re-

quired on this job to perform a unit of work. It must be emphasized that these man-hour figures are accurate only for the house concerned; they can be applied to other houses only with due allowance for all differences in local conditions.

Productivity of Labor — Many factors influence the productivity of labor. Among the most important of these is contractor's plant, or mechanical equipment.

Local habit is another factor influencing labor productivity. In some places men work harder or faster than in others. This factor may make a noticeable difference in masonry or carpentry man-hours required for a given unit of work in different localities.

In unionized territory a third factor which directly affects costs, if not man-hours, is the question of jurisdictions. As an example of this influence on costs, unions in some cities permit reinforcing steel to be unloaded at the job and carried to point of placement by common labor. In other places all this handling must be done by members of the steel setters' union.

Factors and influences of this kind must be given due consideration in studying and applying labor cost figures. As a further warning against indiscriminate acceptance and application of man-hours-per-unit figures, it should be noted that construction of a single house is too small a job to determine true averages of the labor required for various items. With these facts in mind the analysis of steel-house costs can be studied intelligently as a source of man-hour labor information.

Cubic Unit Costs — Calling the dining alcove one-half room, the Purdue steel house consists of five and one-half rooms, bath and attached garage. The total contract cost, exclusive of grading and planting, amounted to $4,992. Net inclosed floor area is about 1,170 sq.ft., including garage, and the unit cost of this area is about $4.27 per square foot. Net cubical content totals about 10,220 cu.ft., and the unit cost is slightly less than $0.49 per cubic foot.

It must be noted that these unit costs are based on net inclosed area and content. Mr. Ulmer in his report uses as the cubic content the space inclosed within the outer surfaces of the outside walls between the main roof surface and a plane 1 ft. below the finished floor surface. The garage is estimated at full cubage and the porch at one-fourth its gross cubage. Floor area is measured to the outside of the foundation walls.

On this basis the gross area is 1,289 sq.ft., and the cubic content is 13,850 cu.ft. Resulting unit costs are $3.90 per square foot and $0.36 per cubic foot.

Progress — Total construction time on the job was 91 days, of which 16 were lost because of bad weather, Sundays or other causes. Actual construction was completed in 75 working days.

Hand Labor — Small quantities involved in the excavation and foundation work made hand labor more economical than machine labor on these operations. For the superstructure power tools were used only on minor operations such as drilling holes in the steel panels.

Foundation Costs — Excavation of 35 cu.yd. of earth for the footings and foundation walls was performed for $37.20, a unit cost of $1.06 per cubic yard. Footing concrete amounting to 7.8 cu.yd. was placed for a total cost of $46.60, or a unit cost of $5.98 per cubic yard.

Floor — A 4-in. slab covering 1,289 sq.ft. required 15½ cu.yd. of concrete placed for $149.30, or $9.64 a cubic

Table II . . . Breakdown of Labor Cost

DIVISION OF WORK	SUB-DIVISION	UNIT	QUANTITY	SPECIFIC OPERATION	LABOR CLASSIFICATION	TOTAL MAN-HOURS	MAN-HOURS PER UNIT	WAGE PER HOUR	LABOR COST PER UNIT	COST PER CLASSIFICATION	COST OF OPERATION	SUB-TOTAL LABOR COST	TOTAL LABOR COST
EXCAVATION		Cu. yd.	35	Pick and shovel work	Common	50	1.43	0.43	0.614	21.55			29.45
					Skilled	10½	0.30	0.75	0.225	7.90			
BACKFILL				Pick and shovel work	Common	15		0.42					6.30
FOUNDATIONS	Footings	Cu. yd.	7.8	Preparing to place conc.	Mixed	6½	0.83		0.63		4.10		
				Mixing and placing con.	Common	9¼	1.22	0.43	0.524	4.10			
					Skilled	3¼	0.42	1.00	0.42	3.25	7.35	11.45	
	Wall forms	100 sq. ft.	1,106 Note 1	Const. and installing	Carpenters	54½	4.93	0.60	2.96	32.70			
					Common	21	1.90		0.80	8.80			
					Skilled	23	2.08	1.00	2.08	23.00			
				Removing	Common	10½	0.01	0.50	0.005	5.25	69.75		
	Wall concrete	Cu. yd.	14.0	Mixing and placing con.	Common	31½	2.25	0.43½	0.98	13.75			
					Skilled	9½	0.68	1.00	0.68	9.50			
				Finishing concrete	Common	3	0.21	0.50	0.107	1.50			
					Skilled	8	0.57	1.00	0.57	8.00	32.75	102.50	113.95
	Fill			Fill & Tamp.	Common	15½		0.40				6.20	
FLOOR	Concrete Slab	Cu. yd.	15.5	Mixing and placing	Common	26	1.68		0.71	11.00			
					Skilled	12	0.77	1.00	0.77	12.00	23.00		
				Finishing	Skilled	1½	0.10	1.00	0.10		1.50	24.50	
	Damp-proofing	100 sq. ft.	963	Asphalt on slab	Common	5	0.52	0.40	0.21			2.00	
	Hardwood	100 sq. ft.	818	Laying	Carpenters	45	5.50	0.90	4.95		40.50		
				Sanding	Carpenters	21	2.57	0.90	2.31		18.90	59.40	
	Linoleum	100 sq. ft.	120	Sub-floor	Carpenters	5	4.16	0.90	3.75		4.50		
				Linoleum	Skilled	5	4.16	0.75	3.12		3.75	8.25	
	Cleanup	100 sq. ft.	1,262		Common	12	0.95	0.40	0.38			4.80	105.15
WALLS	Sills	Lin. ft.	330	Setting 145 anchor bolts	Skilled	42						34.65	
	Steel panels	100 sq. ft.	3,136	Erecting	Common	274	8.75	0.40	3.50	109.60			
					Skilled	117½	3.75	0.90	3.37	105.75	215.35		
				Cleaning up	Common	8	0.26	0.40	0.10		3.20	218.55	253.20
ROOF	Steel panels	100 sq. ft.	1,289	Erecting	Common	85	6.56	0.40	2.62	34.00			
					Skilled	41½	3.22	0.90	2.88	37.75		71.35	
	Insulation	100 sq. ft.	1,289	Applying	Roofers	29½	2.29	0.60	1.38	17.70			
					Common	16½	1.28	0.40	0.51	6.60		24.30	
	Roofing	100 sq. ft.	1,289	Appl. built up roofing	Roofers	11	0.85	0.60	0.51	6.60			
					Common	5	0.39	0.40	0.16	2.00	8.60		
				Other work	Common	4½	0.35	0.40	0.14		1.80	10.40	106.05
METAL WORK	Coping flashing	Lin. ft.	158	Installing	Tinners	14½	0.09	0.75	0.07	10.90			
					Tin. helper	19½	0.12	0.50	0.06	9.75		20.65	
	Gutters and downspouts			Backing strips Gutters and downspouts	Carpenter	6		0.90			5.40		
					Tinners	11½		0.75		8.60			
					Tin. helper	6½		0.50		3.25	11.85	17.25	37.90
MILLWORK	Windows	Each	12	Install fram. and sash	Carpenters	17	1.42	0.90	1.27			15.30	
	Doors	Each	12	Inst. door frames	Carpenters	15½	1.29	0.90	1.15		13.95		
				Inst. doors & hardware	Carpenters	67		0.90			60.30	74.25	
	Weather-stripping	Lin. ft.	40	Install copper strip	Carpenters	5	0.13	0.60	0.08			3.00	
	Molds and shelves		Note 2	Installing	Carpenters	78		0.90				70.20	
	Cabinets			Constr.	Carpenters	37		0.90				33.30	
	Screens	Each	13	Installing	Carpenters	13	1.00	0.90	0.90			11.70	207.75
HEATING	Flue		Note 2	Laying Masonry	Mason	9		1.20		10.80			
				Mix. & hod	Common	6½		0.40		2.60		13.40	
	Furnace and ducts		Note 2	Installing	Skilled	20½		1.25		25.65			
					Skilled	20½		1.00		20.50		46.15	
	Furring			Concealing ducts	Carpenters	18½		0.90				16.65	76.20
PLUMBING	Rough		Note 2	Excavation	Common	10½		0.50		5.15			
				Sewer and soil pipe	Plumber	11¼		1.20		14.10			
					Plu. helper	9¼		0.50		4.60	23.85		
				Water and gas lines	Plumber	10		1.20		12.00			
					Plu. helper	10		0.50		5.00	17.00	40.85	
	Fixtures		Note 2	Installing fixtures and trim	Plumber	24½		1.20		29.40			
					Plu. helper	24½		0.50		12.25			
					Common	4		0.40		1.60		43.25	84.10
ELECTRICAL	Rough	100 lin. ft.	60	Conduits	Electrician	4½	7.50	1.00	7.50		4.50		
		100 lin. ft.	600	Inst. cable	Electrician	26½	4.42	1.00	4.42		26.50		
		Each	16	Out. & box.	Electrician	13	0.81	1.00	0.81		13.00	44.00	
	Fixtures			Installing	Electrician	20½						18.50	62.50
PAINTING	Exterior walls	100 sq. ft.	1,300	Prime coat	Common	18	1.38	0.40	0.55		7.20		
				2nd. coat	Painter	20	1.54	0.50	0.77		10.00		
				Sand coat	Painter	29	2.23	0.50	1.12		14.50	31.70	
	Int. walls and ceilings	100 sq. ft.	2,908	Plastic pa. 2 coats	Painter	106½	3.66	0.50	1.83	53.25			
					Plasterer	9	0.33	1.25	0.41	11.25		64.50	
	Closets and garage	100 sq. ft.	725	Two coats	Painter	24	3.31	0.50	1.65	12.00			
				Touch up	Painter	4	0.55	0.50	0.28	2.00		14.00	
	Floors	100 sq. ft.	818	Fill. & stain	Painter	14½	1.77	0.50	0.89		7.25		
				Shel. & wax	Painter	17	2.08	0.50	1.04		8.50	15.75	
	Exterior trim			Prime coat	Painter	15		0.50			7.50		
				2nd coat	Painter	15½		0.50			7.75		
				3rd coat	Painter	14		0.50			7.00	22.25	
	Interior trim			Prime coat	Painter	23		0.50			11.50		
				2nd coat	Painter	25		0.50			12.50		
				3rd. coat	Painter	31		0.50			15.50	39.50	
	Cleanup				Painter	1½		0.50				.75	188.45
TOTAL LABOR COST													1,271.00

Note 1—553 sq. ft. of wall formed both sides.

Note 2—For quantity see Table III, Breakdown of Material Cost.

yard. The cost per square foot was $0.118. Damp-proofing 963 sq.ft. with asphalt emulsion cost $9.30, about $0.01 per square foot. Sub-floor for the linoleum cost $10.80 for 145 sq.ft., or $0.075 per square foot. Linoleum for 120 sq.ft. totalled $30.00 in materials and labor, equal to $0.25 per square foot. Oak flooring for 818 sq.ft. cost in all $136.90, or $0.167 per sq.ft.

Walls — Setting 330 lin.ft. of sills and anchor bolts cost $44.35, or $0.134 per linear foot. Gross area of wall panels was 3,136 sq.ft., costing $1,150.85, or $0.366 per square foot. In all, exterior walls cost as follows: exterior painting, $0.08 per square foot; wall panels and anchoring, $0.38; interior painting, $0.04 — a total unit cost of $0.50 per square foot. Because of a saving in painting of $0.04 per square foot, interior partitions cost $0.46 per square foot.

Roof — An area of 1,289 sq.ft. was roofed with cellular steel panels for $501.05, or $0.389 per square foot. Insulation boards cost $96.05, or $0.074 per square foot installed. Roofing came to $88.95, equal to $0.069 per square foot. Total roof cost excluding ceiling finish was $686.05, a square foot cost of $0.532. Adding $0.04 for interior ceiling finish, the total unit cost is $0.572. Metal work totaled $115.00.

Millwork — Double-hung windows having 1⅜-in. pine sash were shipped to the job completely assembled with frames and hardware ready to be set in the openings of the steel walls. Space between window frames and steel openings was caulked. Window frames have a zinc jamb which automatically acts as weatherstripping.

Exterior doors were 1¾-in. pine, two panel, with top panel glazed. Interior doors were 1⅜-in. pine, with one fir panel. The garage was fitted with one pair of side-hinged stock doors with upper panel glazed. Kitchen and entrance doors were weatherstripped with bronze strips attached to the door and frame and sill.

Yellow pine in stock mill sizes was used for trim around door and window openings. All trim was of plain design ⅝ in. thick. Finish in each room included ¾x4½-in. base boards and a ¾x4½-in. crown mold needed to conceal the roof support angles at ceiling line. Closet shelving was ¾x11½ in. The total quantity of all trim was 1,457 lin.ft. Total labor and material cost of windows, doors, hardware and trim was $618.55. Kitchen cabinets cost $68.00. Window screens covering one-half of each window area totaled $41.35.

Heating — A masonry chimney cost $39.60. The heating system is operated with a three-burner, gas-fired warm-air heater. Warm air ducts are 26-gage galvanized iron varying in size from 4x30 in. to 4x10 in. Cost of the heating plant, including ducts installed, was $330. Furring to conceal the ducts cost $21.35. Total cost of the heating system was $390.95.

Plumbing — Vitrified tile 4 in. and 6 in. in diameter was used for sewer and drains, standard weight cast-iron pipe for soil lines and fittings; galvanized iron pipe and fittings for the 1¼-in. gas line and the ½- and ¾-in. water lines. The house has two exterior hose bibbs. Plumbing roughing-in cost $183.10. Fixtures and finished plumbing of standard grade, including nickel plated brass pipe for exposed lines, were installed for a total cost of $207.90. The total plumbing cost was $391.00.

Electrical Work — For power, telephone and radio wires rigid iron conduits of 1½-in., ¾- and ½-in. size were installed through the foundation walls and under the floor slab. From distribution points 600 ft. of BX armored cable, costing $44.85 or $0.074 per linear foot installed, extended the lines beyond the rigid conduits. Roughing-in included one panel board and mounting and fourteen convenience outlets, twelve fixture outlets and fifteen switch outlets — A total of 41 outlets. The twelve fixtures averaged $2.05 each. Total cost of the electrical installation was $125.00, or $3.05 for each of 41 outlets.

Painting — After sealing the joints between panels, three coats of cement paint were applied to the exterior of the walls. Color was obtained with the third coat, to which sand was added to produce a rough sand textured finish resembling stucco. Interior walls and ceilings, except closets and garage, were finished with two coats of casein base plastic paint applied with a trowel or with a wide brush and stippled. Closets and garage received two coats of lead and oil tinted to the desired color. Exterior painting cost $104.00 for 1,300 sq.ft., or $0.08 per square foot. Interior painting of 2,908 sq.ft. was done for $118.90 — a unit cost of $0.04 per square foot. Painting of closets and garage cost $20.50 for 725 sq.ft., equal to $0.028 per square foot. Hardwood floors were stained and filled in one operation, and then were shellacked and waxed at a total cost of $23.95, or $0.029 per square foot for 818 sq. ft. Three coats of lead and oil paint were applied to exterior and interior trim; cost: exterior, $34.95; interior, $58.90; total, $93.85.

Table III . . . Breakdown of Material Cost

DIVISION OF WORK	SUB-DIVISION	SPECIFIC OPERATION	Material used	Quantity	Cost	Cost of Oper'n.	Sub-Total	Total
FOUNDATIONS	Footings	Concrete	Cement	21½ sacks	$16.15	$	$	$
			Bank run gravel	6 cu. yd.	6.00			
			Mixer rental		3.25		25.40	
	Walls	Forms	Lumber No. 2 Y. P.	3200 bd. ft.	70.50			
			Milled forms	310 lin. ft.	7.05			
			Nails	38 lb.	2.15	79.70		
		Concrete	Cement	55½ sacks	41.65			
			Bank run gravel	20 cu. yd.	20.00			
			Mixer rental		8.50	70.15	149.85	175.25
FLOOR	Concrete	Slab	Cement	66 sacks	49.50			
			Bank run gravel	20 cu. yd.	20.00			
			No. 3 sand	3190 lb.	1.75			
			No. 6 gravel	4470 lb.	2.50			
			6x6 in. Reinf. Mesh.	100 lb.	9.85			
			¼ x 2 x 2 in. angle	8 lin. ft.	1.00			
			Mixer rental		9.00		93.60	
	Dampproofing		Asphalt emulsion	10 gal.			7.30	
	Flooring	Sub-Flooring	1 x 6 in.–14 ft. No. 2 Y. P.	168 bd. ft.		6.30		
		Sleepers & Spikes	2 x 4 in.–14 ft. No. 2 Y. P.	560 bd. ft.		24.90		
		Hardwood	Sel. oak ¾ x 2¼ in.	1090 bd. ft.		77.50		
		Linoleum	Standard gage	16— sq. yd.		20.00	128.70	229.60
WALLS	Sills	Anchor Bolts	½ x 4 in. and 6 in.	145			4.60	
	Steel Panels	Wall	Prefabricated				932.30	936.90
ROOF	Steel Panels	Roof	Prefabricated				429.70	
	Insulation	Rigid Board	1 x 22 in. x 47 in.	1510 sq. ft.		65.75		
	Roofing	Roofing Felt	75 lb. per square	15 squares	31.95			
		15 lb. per Square Asp. Felt	65 lb. per roll	11 rolls	20.40			
		Primer	Cut-back asphalt	5 gal.	1.80			
		Mop Coats	Asphalt	1300 lb.	18.85	73.00	138.75	568.45
METAL WORK	Coping Flashing	Formed Metal Coping	26 gage	158 lin. ft.				
			Aluminum Clips					
	Gutters & Downspouts	Backing Strips	1 x 8 in. cypress	60 lin. ft.				
		Metal Gutters	26 gage	60 lin. ft.				
		Downspouts	3½ x 3 in.	18 lin. ft.				91.90
MILLWORK	Windows	Assembled Sash & Frames	Double hung	12				
	Doors	Doors and Frames		16				
	Trim	Miscellaneous Trim	Y. P. molds	1023 lin. ft.				
			Y. P. Casing	355 lin. ft.				
			Y. P. shelving	79 lin. ft.		386.30		
		Hardware	Lock sets	15 sets				
			3½ x 3½ in. butts	16 sets		42.50		
		Weatherstripping	Copper	40 lin. ft.		3.00	431.80	
	Cabinets, Kitchen	Material	C. C. doors	9		11.80		
			Y. P. boards and molds			19.40		
			Hardware			3.50	34.70	
	Screens	Doors & Windows	16 mesh-copper	13			29.65	496.15
HEATING	Flue	Masonry	Brick	360		9.00		
			Prepared mortar	4 sacks		2.60		
			No. 3 sand	2300 lb.		1.25		
			8 x 12 in. lining	12 lin. ft.		5.10	17.95	
	Furnace & Ducts	Cold Air Ducts	4 x 8 in. G. I.	20 lin. ft.				
		Hot Air Ducts	Galv. iron	57 lin. ft.				
			Registers	12				
			Damper Regulators	8				
		Furnace—Gas Fired	Complete	1			283.85	
	Furring	Concealing Ducts	Plywood				4.70	306.50
PLUMBING	Rough	Sewer—4 & 6 in.	Vitrified tile	96 lin. ft.	40.00			
		Soil Pipe & Fittings	Standard C. I.		39.25	79.25		
		Water & Gas Pipe & Figs.				27.60	106.85	
	Fixtures & Trim	Lavatory—Enam. Iron	18 x 20 in.	1		16.00		
		5-Ft. Tub & Concld. Wste.	Enameled iron	1		42.00		
		Water Closet, Seat & Cov.	Vitreous china	1		19.00		
		Sink—Enam. Iron	22 x 42 in.	1		26.50		
		Laundry Trays	Galv. iron	1		7.00		
		H. W. Tank & Gas Heater	20 gal.	1		15.00		
		Accessories		4		6.00	131.50	238.35
ELECTRICAL	Rough	Conduits	1½, ¾ and ½ in. black	60 lin. ft.		7.10		
		Cable	B X	600 lin. ft.		16.00		
		Outlets	Outlet boxes	16		3.55	26.65	
	Finish		Switches	14	2.87			
			Plates	25	1.68	4.55		
		Fixtures		12		24.60	29.15	55.80
PAINTING	Exterior Wall	3 Coats	Cement paint	20 gal.		66.25		
			Linseed oil	4 gal.		3.60	69.85	
	Int. Walls & Clgs.	2 Coats	Plastic paint	300 lb.		51.60		
	Garage & Closets	2 Coats	Paint—lead and oil	2 gal.		6.00	57.60	
	Floors	Filler & Stain				3.05		
		Shellac & Wax		2 gal.		4.60	7.65	
	Ext. Trim	3 Coats	Lead	56 lb.		6.25		
			Linseed oil	3 gal.		2.70		
			Turp. and dryer	¾ gal.		2.00		
			Color	2 lb.		.90	11.85	
	Int. Trim	3 Coats	Paint—lead and oil	6 gal.			18.00	164.95
TOTAL MATERIAL COST								$3263.85

JOB ODDITIES

A MONTHLY PAGE OF

Unusual Features of Construction

"HOW ARE WE DOING?"

Scoreboard at Tygart dam, Grafton, W. Va., being built by Frederick Snare Corp., New York City, under direction of U. S. Engineers, keeps construction force up to date on quantities placed in structure.

BOLT STRETCHER

(right) **at Pickwick dam, TVA project on Tennessee River, prestresses anchorage bolt for lower gate of navigation lock by tightening sleeve nut with large wrench moved by hydraulic jack, which puts desired stress in bolt as determined by previous extensometer test.**

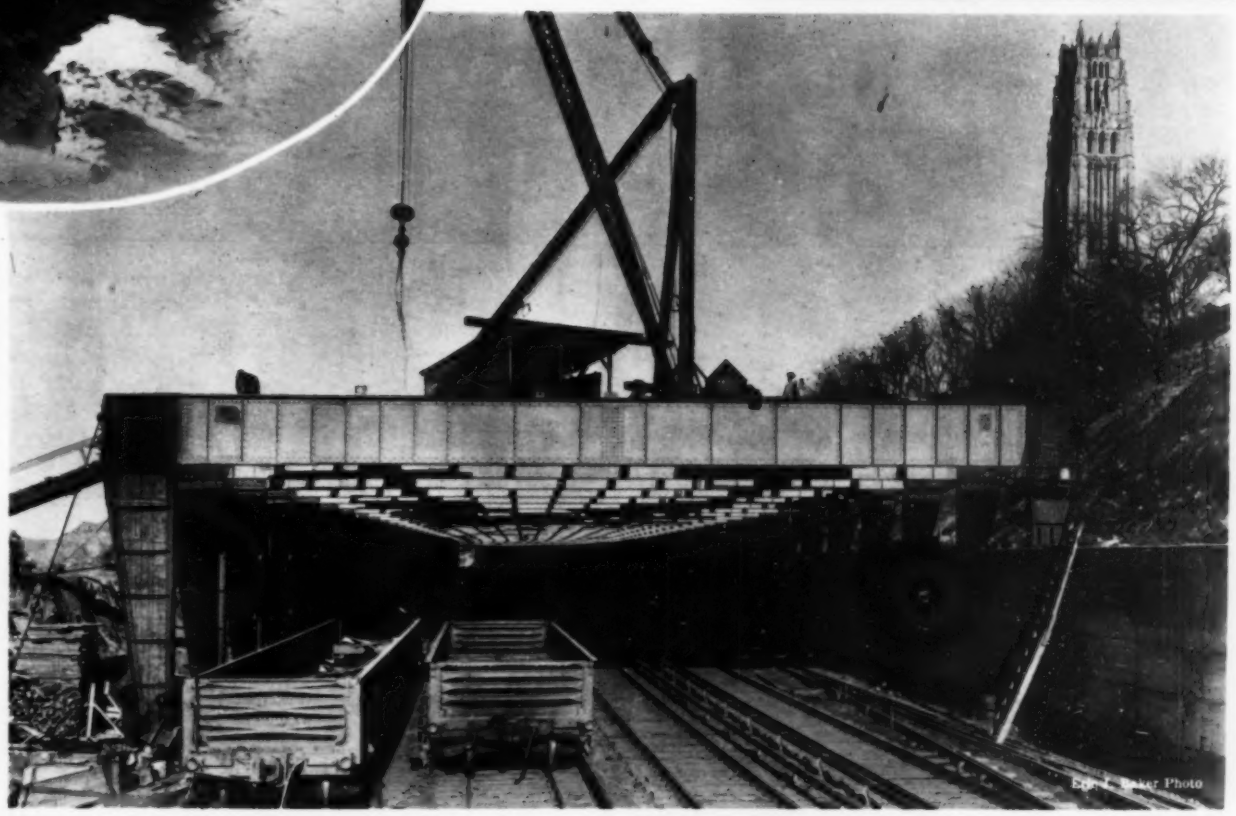
STONE DOOR

(right) **in terrace wall of Nemours Carillon Tower, near Wilmington, Del., described elsewhere in this issue, comprises granite facing backed up by Gunite in structural frame swinging on steel hinges. Door corresponds in appearance with granite-veneered walls of terrace and provides 3x3½-ft. opening for taking caskets into basement crypts.**

Acme Photo

ANCHORS AWEIGH

for section of U. S. 50 crossing White River valley just west of Brownstown, Ind., as earth embankment leaves moorings and moves downstream in January flood. Overflow bridges provided in this highway embankment (*Construction Methods*, Jan., 1935, pp. 34-36) prove inadequate to take care of 1937 flood.



LONG AND SHORT OF IT

hold up their ends *(right)* as unequal legs of steel rigid frames support cross girders above New York Central freight tracks between Hudson River and Riverside Drive, New York City. Following construction of concrete shell on steel frames, land will be graded over railroad tunnel, creating unbroken expanse of public park from drive to river's edge. Extent of work is indicated by photograph in "News Reel" section of this issue.

ALUMINUM CABLES *(left)*, steel-reinforced, transmit 220,000-volt power on Big Creek line of Southern California Edison Co.

Aluminum Alloys
In Construction Equipment

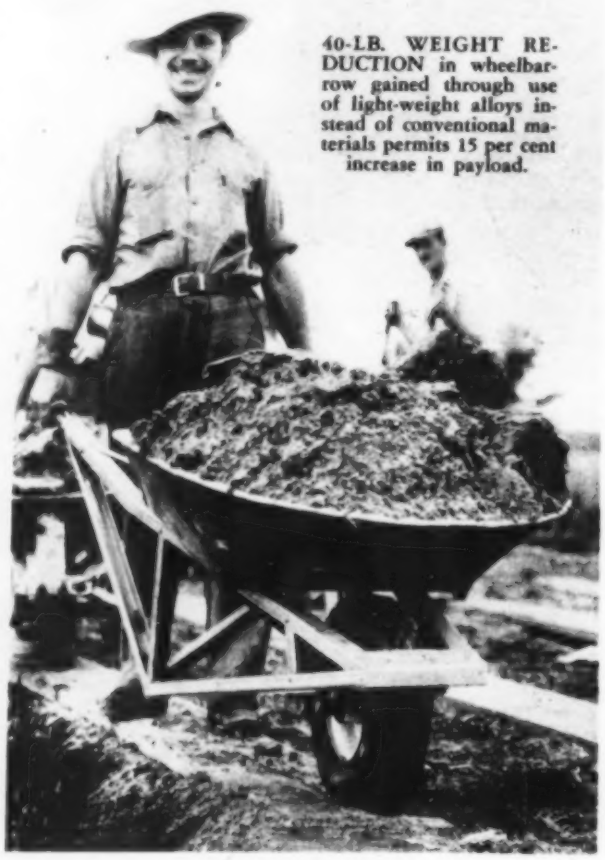
By B. J. FLETCHER
Aluminum Company of America

TO MEET the demand for high speed and output in construction there has been a general increase in size of equipment. During recent years dragline buckets and booms, power shovel dippers, truck bodies, concrete buckets and many other items have doubled or tripled in capacity. Where quantities reach huge proportions, the basic economy of large production units is self evident. For efficient speed and economy moving units must be not only large but also relatively light. Strong alloys of aluminum frequently offer the best available combination of light weight and strength.

Aluminum Alloys — Research has developed a series of aluminum alloys for varying types of service. Table I gives typical mechanical properties of several commonly used alloys.

Alloys 3S and 52S are known as "common alloys." Their physical properties can be varied by the amount of cold working received during their fabrication into various wrought products. The remainder are known as "strong alloys." They derive their physical properties from accurately controlled heat treatment. Alloys 3S, 52S and 53S-T are highly resistant to corrosion and are used where this factor is of greater importance than extremely high strength. These alloys can be welded readily although the operation is accompanied by some reduction in strength. Their forming characteristics are good, but they are not so hard as the other alloys and will not stand heavy abrasion.

Alloys 17S-T and 27S-T have proved most economical for highly stressed structural parts. In the annealed temper, they can be formed readily but in the heat-treated temper, only limited forming operations can be performed. Welding results in serious reduction in the properties of the heat-treated materials. The abrasion resistance of 17S-T and 27S-T is good, but where there is danger of abrasion by hard material at high pressures exposed parts should be protected by alloy steels. Alloys 3S, 17S, 27S, 52S and 53S are available in the form of wrought products such as rolled sheet and plate, structural shapes, tubing, bar stock and extruded shapes. Alloys 17S-T and 27S-T are produced in a wide range of structural material with shapes up to 6 in. by 4 in. angles and 12-in. channels 85 ft. long and in plates up to 120 in. wide, weighing up to 2,000 lb. per plate.



40-LB. WEIGHT REDUCTION in wheelbarrow gained through use of light-weight alloys instead of conventional materials permits 15 per cent increase in payload.

Heavy duty forgings such as power shovel dipper bails and latch bars are usually made from alloy 14S-T. Single forgings weighing more than 1,300 lb. have been made.

Heat-treated aluminum castings in alloy 220-T4 have given good service in many applications where stresses and impact are not too severe. Single castings weighing more than 2,400 lb. have been made in this alloy.

In the construction field the principal job of aluminum alloys has been the elimination of dead weight without sacrifice of thickness and bulk. Weight can be reduced by the use of high-strength metals, but use of such metals involves a drastic reduction in thicknesses.

Dragline Booms — Development of large-capacity, long-reach dragline excavators was stimulated by the demand for economical handling of tremendous quantities of earth on Mississippi River levees. Bucket sizes mounted to 6, 8, and 10 yd. Boom lengths went from 125 to 150 and 175 ft. The time for a complete cycle was held below 1 min. In these machines, stability against overturning and need for minimum swing inertia suggested less dead weight in the boom. Aluminum alloys reduce the weight of boom parts about 50 per cent. Aluminum is substituted for steel in the outer sections of the boom; jaw plates usually are retained in steel because weight saving at this point is secondary. Reduction in boom weight makes possible increases of from 15 to 20 per cent in boom length, or from 20 to 25 per cent in bucket capacity. A machine equipped with an aluminum boom costs about 5 per cent more than one wit' a steel boom.

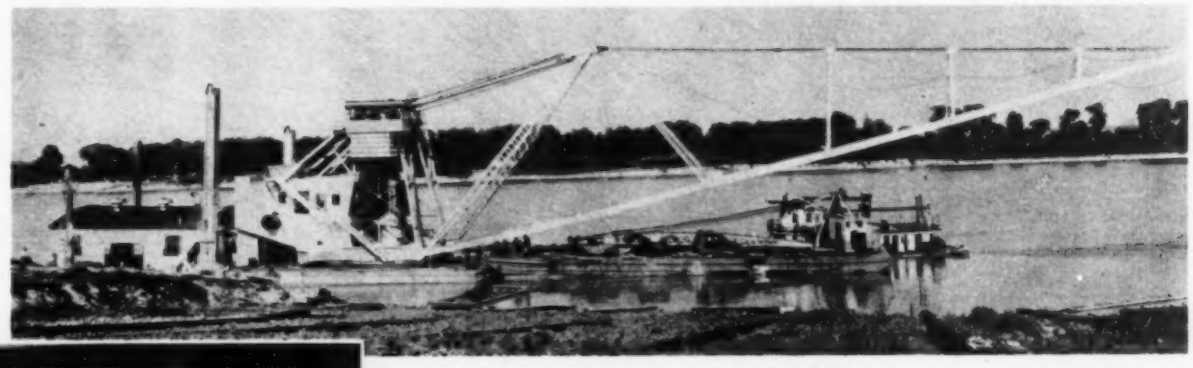
12-CU.YD. DUMP BODY of aluminum alloys is one of five used by George M. Brewster & Son in building Mohawk dam in Muskingum Watershed Conservancy District, near Warsaw, Ohio.

Aluminum dragline booms from 70 to 175 ft. in length were used on the Mississippi levees. Elsewhere aluminum booms have been used in strip mining, drainage and highway projects. A boom recently built for levee work has a total length of 240 ft., with the outer 150 ft. constructed of aluminum alloys. For maintenance of river banks and levees, the U. S. Engineers have four versatile floating machines equipped with aluminum booms varying from 155 to 180 ft. in length.

Special ditching machines have been developed with alu-

minum buckets and supporting structures. In the belt conveyor systems for certain types of excavation, aluminum booms have been used on the distributing end to reduce overturning moment.

Light weight is a convenience in the handling of guy or stiff-leg derricks and is an aid to increased capacity in traveling cranes. Because this weight reduction in most cases is a convenience rather than a necessity, it is more difficult to justify the extra cost of aluminum booms. On traveling cranes stability of the unit definitely limits the size of the load. On a navigation dam near Pittsburgh, the contractor used a 100-ft. aluminum boom on a whirler crane. The extra reach eliminated the necessity for using two derricks to place concrete in the toe of the dam and resulted in savings many times greater than the original cost of the boom.



240-FT. BOOM of clamshell dredge designed and operated by Sternberg Dredging Co., St. Louis, has 150-ft. aluminum alloy peak section.

ALUMINUM SHOP FABRICATION METHODS correspond to steel. Electric tool reams rivet holes in 28-ton aluminum alloy emergency bulkhead units fabricated by Nashville Bridge Co., Nashville, Tenn., for new Gallipolis roller-gate dam on Ohio River. Each of seven bulkhead units is about 129 ft. long, 4 ft. high and 12 ft. deep.

Shovel Dippers — A great advance in power shovel construction has accompanied the development of coal stripping operations in the Middle West. Stability and swing speeds limit the size of dippers which can be used. Steel dippers weigh from 3,500 lb. to 4,000 lb. per cubic yard of capacity. The use of aluminum alloy plates, shapes, castings and forgings has resulted in a reduction of weight to about 2,000 lb. per cubic yard of capacity, permitting an increase of about 30 per cent in dipper size. The shovel costs about 6 per cent more than a machine equipped with a steel dipper. At present more than fifteen aluminized dippers (3 to 32 cu.yd.) are in service. They have proved durable and efficient in handling loam, clay, shales and sandstones of the coal fields.

Aluminum alloys have been used in a number of drag and clamshell buckets. For heavy digging, dead weight is desirable in these units, but for many types of special service, increased capacity can be obtained by reducing dead weight and applying correct design to assure digging efficiency.

The economy and suitability of aluminum for truck bodies is demonstrated by the thousands of units used to transport general freight, gasoline and other commodities. Truck haulage is becoming increasingly popular in construction. At Norris dam four aluminum alloy tank-type truck trailers transported bulk cement. On the Mohawk dam in Ohio the contractor used five 12-cu.yd. aluminum dump bodies. The 16-cu.yd. aluminum dump body at Boulder dam was one of the largest units ever built for such service. In such installations light-weight aluminum bodies permit increases in capacity without overloading tires, axles or chassis and reduce both operating and maintenance costs.

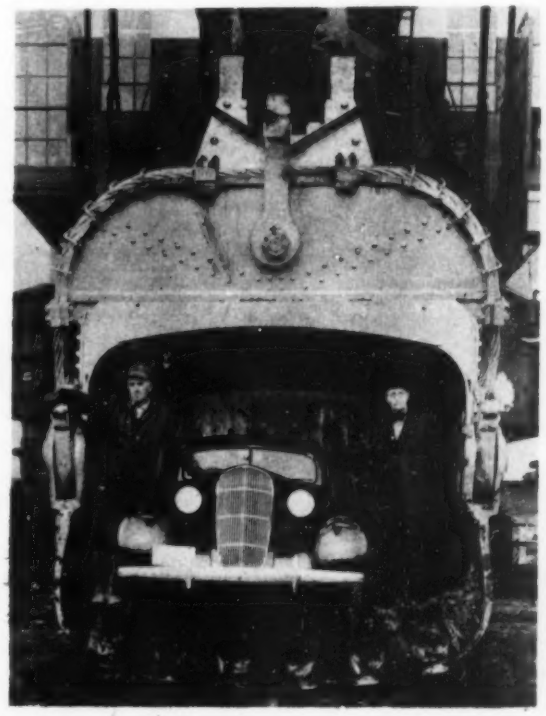
Hand Tools — Weight moved by man is costly weight. The development of light, easily handled equipment and small tools has been steady if not spectacular. Aluminum carpenter's tools, shovels, wheelbarrows, drills, surveying instruments, rail punches and benders and scores of similar items are standard products in daily use. Aluminum alloy needle beams for scaffolding supports are strong, easy to handle, and economical to ship. Concrete chutes require less labor to handle and have proved remarkably resistant to corrosion. Aluminum screeds and floats have been used in concrete finishing.

In the engineering phase of construction work, aluminum surveying instruments are being used, while a recent development has made available a surface finish for aluminum sheet which adapts it to use for filed drawings such as plane tabling work. The U.S. Engineers' Office at Buffalo, N.Y., has just designed and placed in service a sweep-float for hydrographic surveys in which the use of aluminum alloys for the pontoon and miscellaneous parts has resulted in a weight reduction which cuts the difficulties, dangers and cost of transportation.

The general success and economy of aluminum construction equipment indicates that the use of these alloys will advance as the advantages are more generally recognized.

In addition to the established uses mentioned, attention has been given to the use of aluminum alloys for cableway carriages, dump cars, concrete buckets, concrete forms, dredge ladders, drill rigs, dump wagons, skips, shaker screen frames, and tramway buckets.

In these and other services aluminum alloys solve many of the problems connected with construction plant equipment. They offer the construction industry an opportunity to increase the efficiency of construction operations.



32-CU.YD. POWER SHOVEL DIPPER *(right)*, largest in existence, constructed of aluminum alloys, serves Northern Illinois Coal Corp. in stripping operations.

Table I . . . Typical Mechanical Properties of Commonly Used Aluminum Alloys

Alloy and temper(4)	Ultimate tensile strength lb. per sq. in.	Yield (1) strength lb. per sq. in.	Shear strength lb. per sq. in.	Elong. per cent in 2 in.	Endurance limit lb. per sq. in.	Brinell Hardness 500 kg. 10 mm. ball	Density lb. per cu. in.
3S-½H	21,000	18,000	14,000	16	9,000	40	0.099
52S-½H	37,000	29,000	21,000	14	19,000	67	0.096
14S-T	65,000	50,000	40,000	10	15,000	130	0.101
17S-T	58,000	35,000	35,000	22	15,000	100	0.101
27S-T	60,000	50,000	37,000	11	13,000	115	0.101
53S-T	38,000	32,000	26,000	20	11,000	80	0.097
22O-T4	44,000	26,000	24,000	13	7,500	75	0.092

(1) Stress which produces a permanent set of 0.2 per cent of the initial gage length.
(2) For all alloys Young's modulus of elasticity is about 10,300,000 lb. per square inch, or approximately 35 per cent of that for steel.
(3) Density varies slightly with the alloying elements used, averaging 35 per cent of that for steel.
(4) Alloy nomenclature is that of the Aluminum Company of America. Alloy 22O-T4 is a casting alloy; others are wrought alloys.

GAS OR *Diesel* FUEL OIL . . .

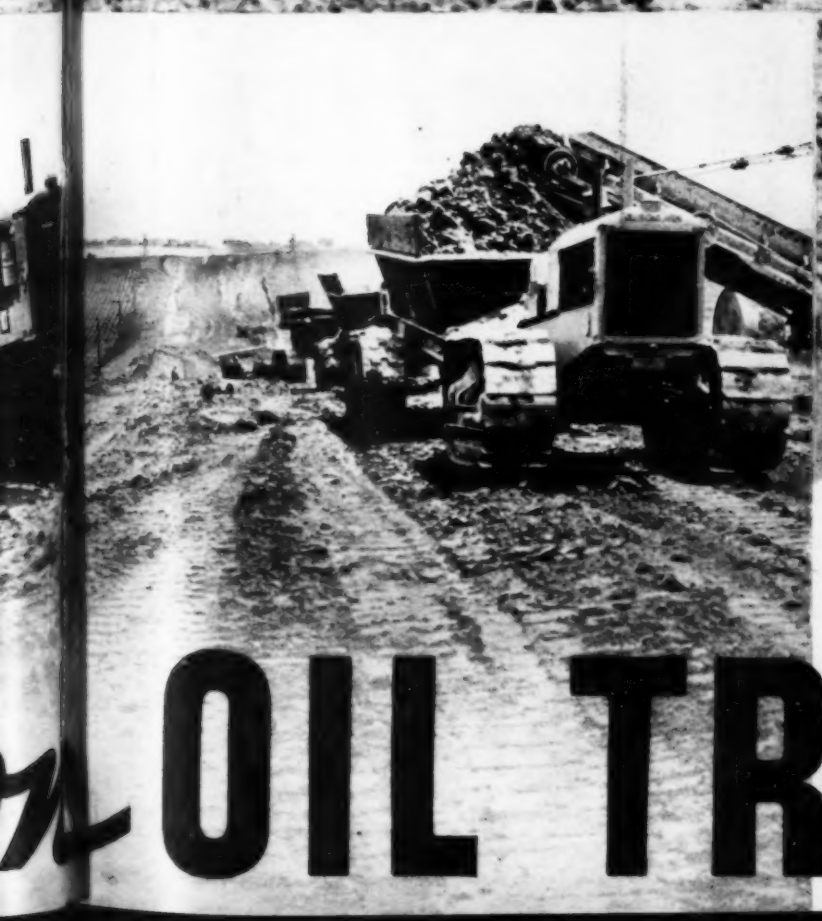
ALLIS-CHALMERS OWNE

EVERY year, more contractors and public bodies standardize on Allis-Chalmers tractors. The reason is that Allis-Chalmers has modernized the track-type tractor—with more and higher speeds ... more power per ton of weight ... greater use of anti-friction bearings ... better balance ... more flexibility ... and modern, more efficient design throughout—all of which mean "cheaper per yard" dirt moving. In the same way, Allis-Chalmers has developed and perfected an improved method of burning Diesel fuel oil. Controlled Ignition Oil Tractors give you MORE than Diesel fuel economy! They also give you such additional advantages as instant starting, balance, smoothness and flexibility—with no need for a special grade of fuel, special lubricating oil, special high-pressure construction or an auxiliary starting motor. No wonder Allis-Chalmers owners are "repeat" owners! Ask the A-C dealer.

ALLIS-CHALMERS MANUFACTURING CO.
Tractor Division
Milwaukee, Wisconsin, U.S.A.

Controlled Ignition

IERS **REPEAT**



FRANK EBLEN "REPEATS"

One of the contractors who took the first experimental Model "L" Tractor and "gave it the works" was Frank Eblen of Walnut, Ia. Eblen was so favorably impressed with the experimental machine that he ordered Model "L's" for his own use as soon as they went into production—and he has been a consistent Allis-Chalmers user ever since. Some of his present A-C tractors are shown here.

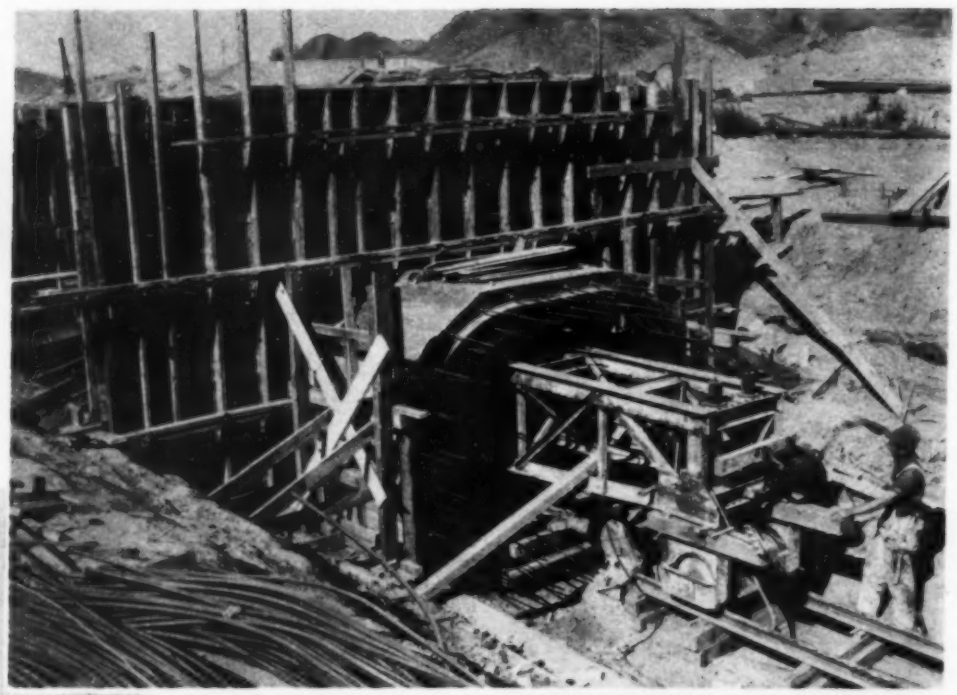
OIL TRACTORS

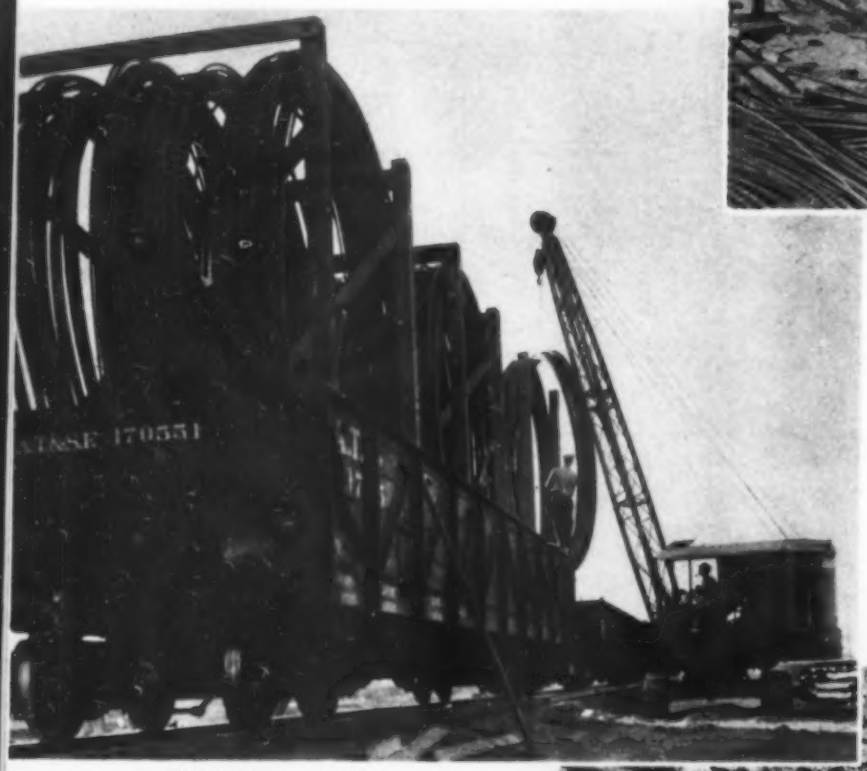
Getting Down to

DETAILS

Close-Up Shots of

Job Methods and Equipment





WELDED RINGS

of ¾- to 1¾-in. reinforcing bars for 16-ft.-diameter conduit of Colorado River aqueduct being built by Metropolitan Water District of Southern California are loaded after shaping and welding at yard by Universal crawler crane powered by Waukesha Hesselman engine operating on about 1½ gal. per hour of diesel fuel oil costing 4½c. per gallon.

STEEL NEEDLE BEAM

supports interior forms of concrete conduit designed to carry steel discharge pipe for sludge from desilting basins at Imperial dam, being built by Morrison-Knudsen Co., Inc., Utah Construction Co. and Winston Bros. Co., under direction of U. S. Bureau of Reclamation to divert Colorado River water to All-American canal. For contractor, R. M. Conner is general superintendent, M. H. Brown, Jr., assistant superintendent, and Charles S. Bradley, engin

PIPE LINE BREAK

(left) in 4-in. cast-iron water pipe is repaired quickly and permanently by use of Dresser split repair sleeves *(above)*, wrench being only tool required, as there are no joints to pour and calk. Split sleeves may be installed under water, if necessary, and breaks often can be repaired without shutting down service in line. Flexibility of repair sleeves helps to prevent future breaks at or near same point. For breaks longer than 8 in., several sleeves can be joined together in multiple installation. Different styles are used for steel pipe (high-pressure and low-pressure) and for repairing bolted joints and cast-iron bells.

SPECIAL SIDE WINGS

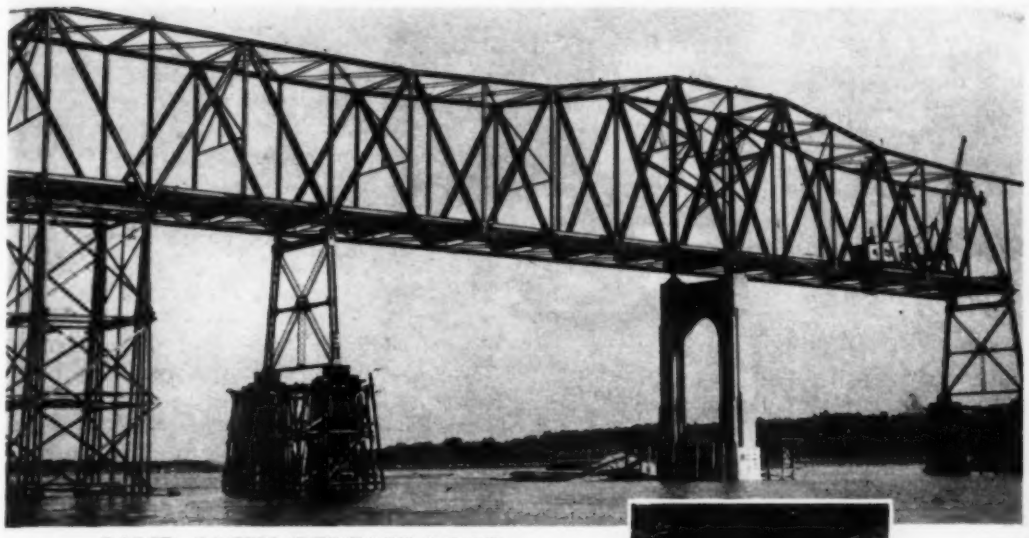
(below) on Le Tourneau bulldozers mounted on Caterpillar 95-hp. diesel tractors reduce spillage and increase earth-moving capacity of Arundel Corp. units engaged in grading operation at Baltimore airport.

WANTED—

Photos of Details

The Editor of Construction Methods and Equipment wants photographs or sketches illustrating interesting DETAILS of method or equipment and will pay for those he finds acceptable for publication.

Hasn't your job produced some DETAIL that might be illustrated on this page? Send along a picture of it; we'll return it promptly if we can't use it.

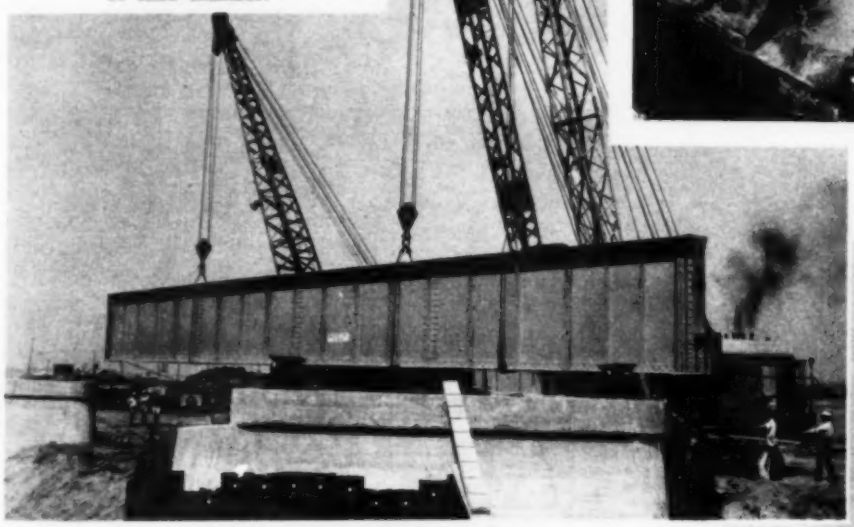


SAND JACKS RELEASE LOAD

from falsework bents under steel bridge. By removing plug from each sand jack *(right)* on temporary steel bents used in cantilever erection of two 1,025-ft. continuous truss spans of four-lane highway bridge crossing Missouri River near Weldon Springs, Mo., Kansas City Bridge Co., contractor for Missouri Highway Department, relieves jack pressure, permitting blocking between top of bent and newly erected steel to be removed. Fine dry sand flows out of jack when plug is withdrawn from hole in wall of sand chamber.

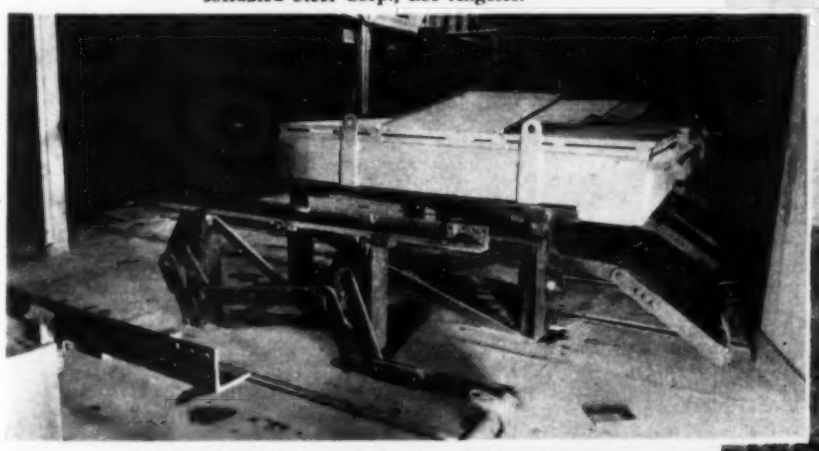
DIESEL-POWERED DUAL-DRUM PAVER

operated by B. Turecamo Contracting Co., Brooklyn, N. Y., comprises Ransome 1-cu.yd. high-capacity dual-drum mixer driven by Buda six-cylinder diesel engine with 909-in. displacement, 5¼-in. bore and 7-in. stroke. All wearing parts of engine are fully sealed as protection against dust from loading skip. Dual-drum paver mixes two full batches simultaneously, one in each of two drum compartments. During progress of mixing, batch is transferred forward from charging compartment to discharging compartment.



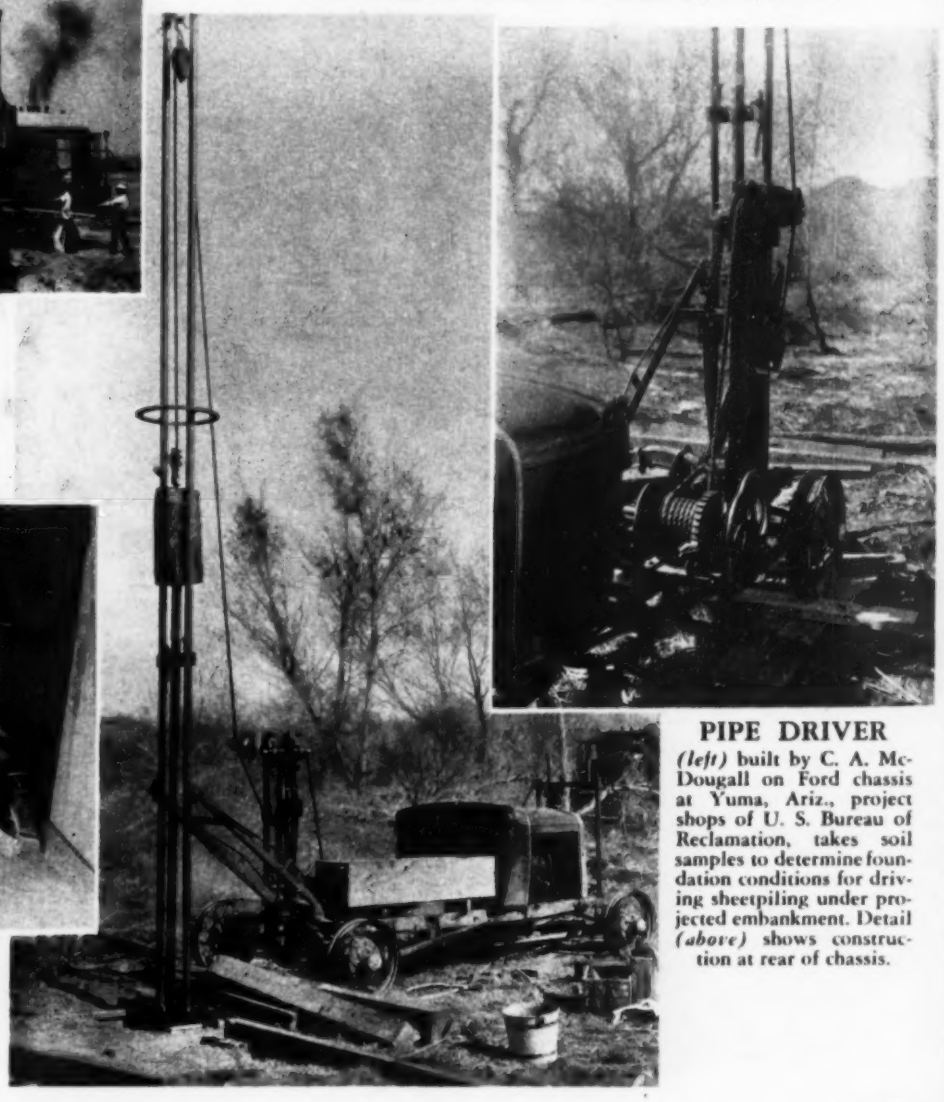
WALKED INTO PLACE

by three crawler cranes, 34-ton plate girder 111½ ft. long by 9 ft. deep is erected on piers of electric railway bridge across Ballona Creek near Culver City, Calif., as part of flood control program being carried out in and around Los Angeles by U. S. Engineer Department with ERA funds, using hired labor and government plant, supplemented by some rented equipment. Bridge is built on dry land over section of relocated channel. Structure requires four girders, fabricated by Consolidated Steel Corp., Los Angeles.



BATTERY CHANGING APPARATUS

used at two district camps of Metropolitan Water District of Southern California along Colorado River aqueduct operates on toggle lever principle, lifting 4-ton 56-cell batteries from large electric locomotives with little effort. Battery capacity of 540 amp.-hr. or more normally allows 8 hr. between changes. Apparatus changes batteries more quickly than traveling cranes equipped with chain hoists.



PIPE DRIVER

(left) built by C. A. McDougall on Ford chassis at Yuma, Ariz., project shops of U. S. Bureau of Reclamation, takes soil samples to determine foundation conditions for driving sheetpiling under projected embankment. Detail *(above)* shows construction at rear of chassis.

Planning and Plant *for* **HEAVY CONSTRUCTION**

FIFTEENTH OF A SERIES OF ARTICLES

Principles and Practices of Job Layout and Selection and Use of Equipment for Large Dams and Appurtenant Works

15 . . . Transporting Equipment *(Continued)*

By ADOLPH J. ACKERMAN and CHARLES H. LOCHER
Construction Plant Engineer *Construction Consultant*
TENNESSEE-VALLEY AUTHORITY, KNOXVILLE, TENN.

Tractor and Scraper Performance

THE SCRAPER is a self-contained unit that is both a loading and hauling outfit and designed primarily for short haul work. It can also be used for a variety of odd jobs such as stripping, grading, leveling and trimming. Plowable materials are best suited for scraper work; sand will not readily climb into the scraper. One or more units can be used independently on a job. In dumping, a scraper spreads the load evenly. Wherever it is practical to use scrapers, moving earth with them offers special economies by eliminating the investment in loading equipment, and sometimes, also, the investment in a bulldozer or grader for spreading the material. Hence, on jobs for which they are adapted, scrapers are at present the best earth movers known.

The pneumatic-tired scraper is built in three representative rated sizes, a 6-yd. unit to be used with a 40-hp. tractor, an 8-yd. unit to be used with 50- or 60-hp. tractor, and a 12-yd. unit to be used with a 75-hp. tractor. The pay load of these scrapers runs from 60 to 80 per cent of the rated capacity, depending on the material being handled. Many operators on hauls of from 1,000 to 4,000 ft. are now using two 12-yd. scrapers in tandem and are getting good results from both a production and cost standpoint; but here again, as on wagon hauls, the loading time and speed of travel govern. A long haul is necessary to make tandem hookups economical; on a short haul, a single unit is the cheaper operation. The large pneumatic tires now used make pulling easier, reduce maintenance by reducing the shock on rough going, and because of their large bearing surface make operations possible on soft routes.

For efficient production it is necessary to plan a careful routing of the unit to avoid traffic interference, and ample provision should be made for turn-around space at the dump or pit. Sufficient digging area is also essential. To decrease waiting time, it is often desirable to provide different out and back routes. At average hauls of 500 ft., hauling can be done at a cost of from 5 to 8c. per cubic yard. The loading time runs from 15 sec. to 90 sec. and the loading distance from 30 ft. to 120 ft., depending on the nature of material and depth of cut. The dumping time varies from 5 to 60 sec., depending on the nature of material and spreading requirements at the dump. A 12-yd. scraper making a 4-in. cut fills in about 100 ft.; it will deposit a layer of 3 to 6 in. or up to a foot or more in thickness.

There are various makes and types of scrapers which, because of the newness of this type of equipment, have been only slightly standardized. Some digging and dumping mechanisms are operated from special power take-offs on the tractor by cables, others by hydraulic pressure, still others by air pressure; in some types separate power units may be attached directly to the scrapers.

Table 5 shows the performance of a 12-yd. (about 10-yd. water level) tractor-and-scraper unit as compiled from LeTourneau data.

Tractors and Wagons — Practically all wagons are rated in heaped loose measure, and the pay load is usually about 75 per cent of the loose measure. Before the advent of rubber-tired equipment, crawler wagons were used almost universally and their capacities range from 6 to 10 yd., water level, their size growing as the size of tractors grew. Most wagons are designed with low clearance for easy loading with elevating graders. The bottom-dump wagons are best suited for earth or rock free of large sizes, whereas heavy rock is usually best handled in side-

Table 5 . . . Performance of 12-Yd. Tractor and Scraper at 80 Per Cent Efficiency

One Way Haul In Feet	Cu. Yd. Hr. Per Unit	Minutes Per Round Trip	Cost in Cents per Cu. Yd. at Various Hourly Cost Rates $4	$5	$6
300	116	3	3.5	4.2	5.2
600	70	5.5	5.6	7.0	8.6
900	50	7.8	8.0	10.0	12.0
1,200	40	10.2	10.2	13.0	15.2
1,500	32	12.7	12.7	15.5	18.5
1,800	27	15	15.0	18	21
2,000	22	17.4	17	21	25

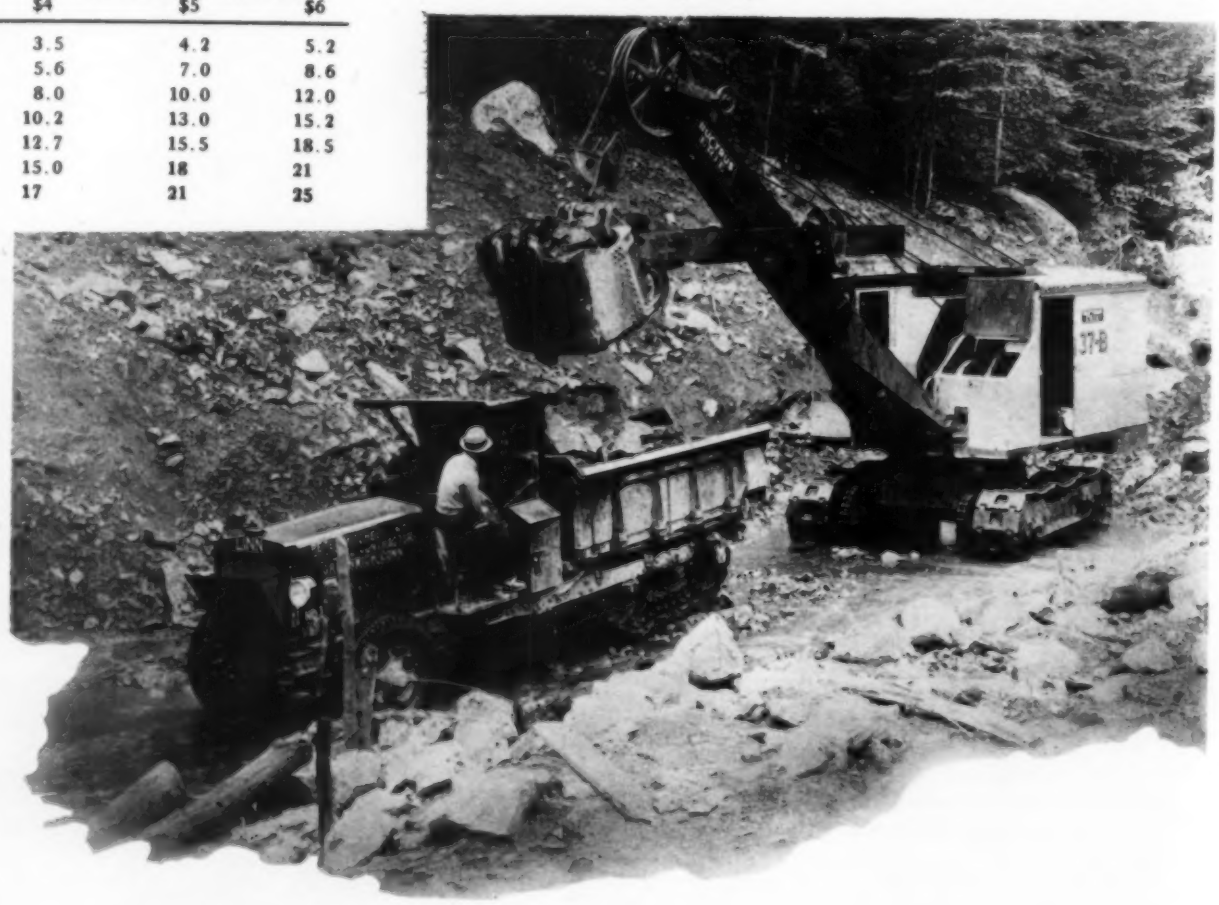


Fig. 8 . . . CRAWLER TREADS on end-dump truck develop needed traction in wet, muddy locations.

dump wagons. Occasionally it is possible to operate two wagons in tandem on longer hauls, but more recently it has been found cheaper to use single wagons at higher speed. As a rule, two men are required at the dump, one for dumping the wagon and one for closing the wagon, although recent attempts, some successful, have been made to make both of these operations automatic or controlled by the tractor operator. Typical capacities of crawler wagons are: A 12-yd. rated wagon has a water-level capacity of 8.07 cu.yd.; a well known 15-yd. wagon has 9.5-yd. water-level capacity; while a flared-side wagon with a rated capacity of 13 yd. actually carries 9¼ yd. at water level. The most important item of maintenance on crawler wagons is to keep the wheel or tread alignment accurate at all times.

For a 500-ft. haul, earth can be moved by tractors and wagons for about 9 to 11c. per cubic yard. This equipment, however, with large wagons is suited to hauling distances up to 4,000 or 5,000 ft. and sometimes greater, especially where the road maintenance due to weather would be too high to provide a good road surface for smaller high-speed trucks.

Tractors and Pneumatic-Tired Carriers — The recent trend has been toward wagons using large pneumatic tires which have made easier hauling for the tractors and thereby have allowed the use of larger units. Pneumatic-tired wagons range in size from 6 to 10 cu.yd., water level, and are cheaper to operate than crawler wagons because the expense of repair to crawler treads is eliminated.

To meet the demand in a particular field, some unusually large so-called "buggies" have been developed with capacities of 24 to 30 yd. loose heaped measure, which run about 18 and 23 yd. water-level measure respectively and are designed for operation with 75-hp. tractors. The buggies are mounted on sixteen rubber tires and the large size is of advantage in permitting the use of large loading units, which allows them in turn to handle large pieces of rock. The construction of the buggy is very simple — the body merely sliding back to dump the load, and such dumping may be accomplished while the unit is in motion. A related type of buggy with a capacity of about 35 yd. heaped, known as a "cradle-dump," is of more recent design; this unit has a lower headroom and is designed for higher speed with a special pneumatic-tired truck hauling

Fig. 9 . . . 7,000,000 CU.YD. of earth is being moved 2½ mi. by fleet of 30 8-yd. trucks operating on Butane gas. When loading, trucks are spotted to save shovel swing.

Fig. 10 . . . ROLLED EARTHFILL DAM in Bouquet Canyon utilizes truck haulage to site, bulldozer spreading and sheepsfoot compactors.

Fig. 11 . . . FOR HAULING ROCK *(left)* at Boulder dam, heavy-duty truck is equipped with special body.

Fig. 12 . . . FRONT-DUMPING TRUCK has tilting body which serves as bulldozer in spreading dumped material.

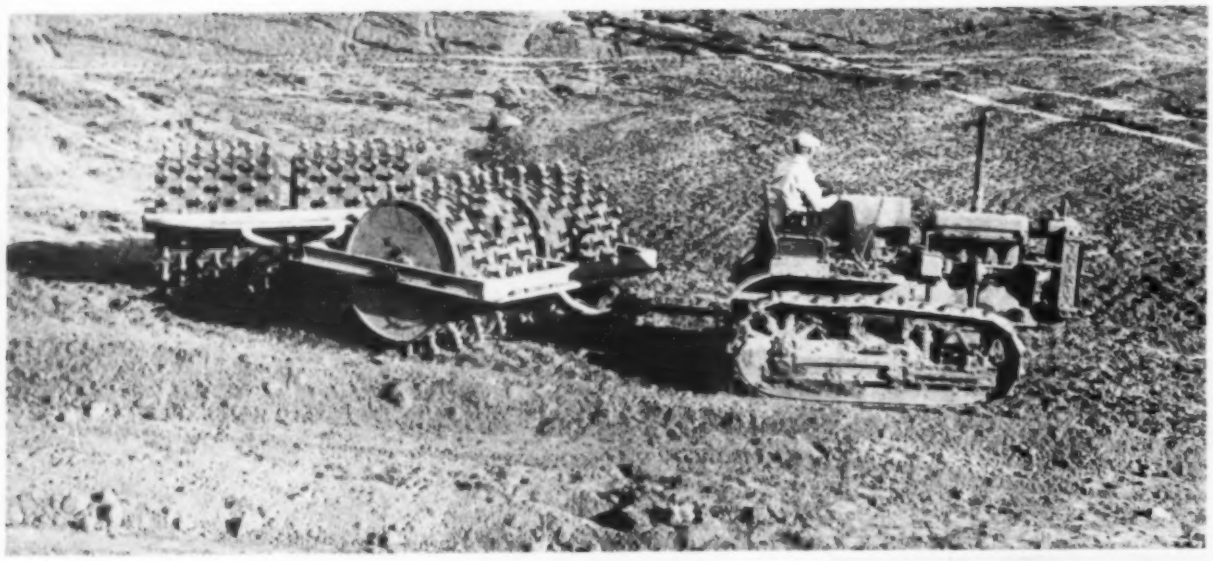


Fig. 14 . . . SHEEPSFOOT ROLLERS compact dumped earth in rolled fill dam.

unit, but its development is too recent to indicate exactly where it is best suited.

The following are representative prices of tractors and tractor-drawn equipment:

35-hp. tractor (diesel)	$4,500
50-hp. tractor (diesel)	6,000
75-hp. tractor (diesel)	7,000
8-yd. w.l. crawler wagon	3,000-3,500
Bulldozer	1,500
12-yd. (rated) scraper	5,500
8-yd. (rated) scraper	4,500
6-yd. (rated) scraper	3,900
30-yd. w.l. buggy	8,300
23-yd. w.l. buggy	7,225
18-yd. w.l. buggy	6,700
7-yd. w.l. truck-wagon, comp.	6,700

Linn Tractor or Truck — The Linn truck is in general type similar to an ordinary truck, except that it has a tractor-type crawler unit on the rear axle in place of wheels. The body, placed directly over the crawlers, gives the unit traction proportional to the load carried. It does not have the speed or capacity of pneumatic-tired equipment which is especially designed for production work, but it is an excellent service unit and particularly useful in bad weather. The Linn wagons range in size of body as follows: 8 cu.yd. body carries 5½ to 6 yd. pay dirt; 14-cu.yd. body carries about 10 yd. pay dirt. They travel at a maximum speed of about 12 mi. per hour, and most machines are designed with four-speed reverse transmission, while some have five speeds each way, giving them the special advantage of operating satisfactorily in shuttle service back and forth, thereby saving the time of turning. It is possible to maneuver the unit up grades as steep as 40 per cent.

Trucks — Truck haulage is becoming increasingly popular on construction projects, and one need only to recall earlier representative jobs where all earth and rock excavat.on was handled by railroad trains, with tracks scattered all over the place, to appreciate the remarkable changes that have been brought about by trucks within the last decade. Trucks of all sizes, types and speeds are offered to construction men, with tonnage ratings that mean very little, and when to this confusion the stress of competitive selling is added, it is small wonder that it sometimes takes months and a long series of breakdowns to determine what the equipment really can do.

Trucks range in size from ½ to 20 yd. cubic capacity, and are most commonly equipped with rear dump bodies. They are considered essentially high-speed hauling units, having average speeds of 5 to 30 m.p.h., depending upon size and road conditions, with top speeds, empty, of 15 to 50 m.p.h. Recent developments in special-size tires have increased the speed of travel. The bodies are usually of special sturdy design and shape, with either open ends or special dumping gates. Dumping is usually actuated by hydraulic hoists, and many mistakes in equipment selection come from using slow-speed hoists or short-travel hoists, which do not bring the body to a steep enough dumping angle to empty the body clean.

Truck bodies of aluminum have come into wider use because of the greater pay load that can be carried as a result of the reduction in dead weight. For example, in one case a 12-yd. w.l. aluminum body weighed 5,120 lb., whereas a 10-yd. w.l. steel body weighed 11,180 pounds. At Norris Dam four tank-type truck trailers were used for transporting bulk cement, and on the construction of the Mohawk dam in Ohio the contractor used five 10-cu.yd. w.l. aluminum dump bodies.

Fig. 15 . . . HAND-CONTROLLED TAMPER actuated by explosions of single-cylinder combustion engine compacts fill close to core walls and abutments.

Fig. 16 . . . 18-YD. WAGON mounted on penumatic tires has hydraulic door-winding mechanism and hydraulic brakes controlled from tractor seat.

Selection of trucks begins by proper adaptation to the loading unit and must take account of the proper relationship between power and tonnage rating of chassis, size of body, weight of material, and volume of material loose and in bank measure. Small trucks are practical for loading with an elevating grader when the cabs are removed, but the loss of time exchanging the trucks under the carrier is so great in proportion to the capacity of the trucks that it decreases the production of both elevating grader and trucks. Large trucks can be loaded by elevating graders by removing the cabs, but these trucks are, in most cases, too high or too wide to load economically, and the average driver, being so close to the end of the conveyor, very seldom gets a full load.

One of the chief advantages of trucks is their great utility for other job purposes. Where good roads or

Fig. 13 . . . TRUCK WAGONS comprise powerful traction trucks and separate bottom-dump trailers, all mounted on large pneumatic tires.

routes are maintained, there is practically no limit to their economical range.

In laying out a large truck haul job, careful planning of the work and preliminary preparation will pay large dividends. Routes should be carefully graded, all humps should be cut off cuts should be properly located, and assignments of trucks to various shovels or loading units should be made to maintain a constant traffic stream. Special traveling foremen, dispatchers, "traffic cops" and servicing trucks with parts, air, gas, oil and water are indispensable features of large scale operations.

One of the most important elements of truck operation is the so-called "preventive maintenance" and inspection at regular intervals. The mechanisms must be kept tight at all times. It doesn't pay to wait for breakdowns to make repairs.

An outstanding truck hauling job was the stripping of the base for Fort Peck dam. A total of 4,100,000 yd. was moved in 120 days, using nine elevating graders, three shovels and three draglines for loading into 250 light, fast dump trucks (mostly of 3-yd. capacity), running at speeds up to 40 m.p.h. on return. On the best day of two 7-hr. shifts, 55,000 yd. was loaded by the graders. The hauling distance ranged from 7,500 to 9,000 ft., and the contract price for stripping and hauling was 31.5c. per yard. The truck hauling on the site of the New York World's Fair is another outstanding example of large scale operations.

Dumptors — A special pneumatic-tired high speed truck known as the "Dumptor" has the unique feature of dumping on the front side and is best suited to short hauls where a shuttle movement is advantageous. The unit has three speeds each way at equal rates, making it possible to eliminate all waste time in turning, and thereby relieving the traffic problem in congested areas. It is capable of handling a maximum load of 5½ yd. and the speeds in low, second, and high are rated respectively at 4½, 8¼, and 16 m.p.h. It can be loaded and dumped quickly, the body dropping forward 90 deg. to a vertical angle for dumping. In general, hauling, dumping, and spreading are accomplished by the driver, since the body is so arranged when it is dumped that the load itself can be bulldozed into a level area.

Truck Wagons — More recently an adaptation of the crawler tractor-and-wagon unit has been developed, which consists of a special pneumatic-tired truck and two-wheeled wagon trailer whose front end is mounted directly on the rear of the truck. No collective name has been established for this type, but a variety of trade names have been employed, such as: "Trail-car," "Trail-dump," "Speedster," "Trac-Truk," and "Semi-trailer." The designation "truck-wagon" is here employed. The truck unit weighs considerably less than a crawler tractor and is designed so that it carries part of the transported load, which aids in developing sufficient traction. The truck-wagons range in capacity from 4 to 9 yd. w.l., and are capable of speeds up to 18 m.p.h. The equipment has an economical operating range from 500 up to 3,000 ft. and more. At 1,500-ft. average haul, material can be transported for 7 to 10c. per cubic yard. Most of the modern truck wagons are designed for dumping and closing by the driver without slowing down or stopping the unit. The truck-wagons are larger than standard trucks and this is a real advantage in cutting down the loss of exchange time at the loading point.

Compactors — For developing suitable compaction on rolled-fill dams, tractor-drawn sheepsfoot rollers are now almost universally used, as shown in Fig. 14. As compared with the older three-wheel smooth rollers, the sheepsfoot has a tamping action as compared with a rolling action, and this results in a bonding between layers and a density of fill greater than can be obtained with smooth rollers. The great freedom with which tractors can maneuver and haul such rollers over a fill greatly adds to their utility. The standard roller usually consists of two drums about 4 ft. long and 4½ ft. in outside diameter, weighing about 2,500 lb., and exerts a bearing pressure of about 125 lb. per square inch of foot area. Further adjustment in weight can be made by filling the roller with water to suit the compaction requirements of the material, thereby developing a unit foot pressure of around 200 lb. per square inch.

Against corewalls or other parts of related structures, and along abutment lines, where it is impossible to work effectively with a large roller, pneumatic tamping hammers have been generally used; but more recently the "Delmag Frog" tamper has been developed, which can do a great deal more work and still can be operated by one man (Fig. 15). It contains a single cylinder combustion engine which actuates the Frog into a jumping action, causing it to rise about 9 in. and move forward 9 in. per stroke, and it can make about 50 strokes per minute. The Frog was introduced on San Gabriel dam in California, where it was found that about 3,000 sq.ft. of area can be compacted per hour of operation.

✥

NEXT MONTH—Chapter 16 of the series on "Heavy Construction" by A. J. Ackerman and Charles H. Locher, to appear in the April issue, will discuss "Special Types of Transporting Equipment," with particular reference to railroad haulage, the Chambers bridge, cableways, tramways, belt conveyors, hydraulic pumping, sluicing and barges.

Portable Generator Set

Drives Light, High-Speed Vibrator

36-LB. VIBRATOR operating at frequency of 9,000 r.p.m. receives power from portable gasoline-engine-generator set *(in circle, right)* mounted on pneumatic tires.

AN electric vibrator driven by a portable gasoline-generator set mounted on a pneumatic-tired carriage consolidated concrete along edges of the pavement and at expansion joints for P. Camillo & Co., of Westfield, N.J., contractor on a 5-mi. section of State Route 25, north of Bridgeboro, N.J., where the New Jersey State Highway Department transformed the existing road into a dual highway by building two 10-ft. concrete lanes 9 in. thick for southbound traffic. One man handled the Viber vibrator, weighing only 36 lb., with a universal motor mounted at the head of a 1¾x31-in. tubular shaft containing a rotor turning 9,000 r.p.m.—fast enough to eliminate all noticeable vibration from the handle and assure speedy consolidation of the concrete.

Overall height of the vibrator is 3 ft. 4 in. Dale & Rankin, of Newark, N.J., supplied with the vibrator a 1-kw. generator driven by a 2.4-hp. gasoline engine to furnish more than 600-w. excess power which can be used for lighting after dark or for running second vibrator. Generator has one lock-type fitting for three-conductor cable leading to vibrator and one ordinary plug-in connection. Third conductor in rubber-covered cable is ground wire.

Adjustable Suspenders

Lower Vertical Pumps

ADJUSTABLE TACKLE utilized by TVA's construction force to suspend four vertical pumps from inclined A-frame booms in the lock cofferdam at Chickamauga dam provided for desired gradual lowering of the pumps during unwatering of the lock area. A possible pumping head variation from 30 to 60 ft. made it desirable to develop a supporting structure that would permit the pumps to be lowered conveniently as the water level dropped.

Two sets of identical 100-hp. electric-motor-driven centrifugal pumping units were used. Two units, shown at the left in the oval illustration, have 14-in. pumps, with 28-ft. shafts, rated at 4,750 g.p.m. at 60-ft. head, and weigh 9,000 lb. each. The two units on the right have 12-in. pumps, with 25-ft. shafts, rated at 4,500 g.p.m , at 60-ft. head, and weigh 15,000 lb. each.

To support each pump a cross-braced timber A-frame was set on timber cribbing leaning over a sump dredged in the overburden prior to cofferdam closure. Cables anchored to the river side of the steel sheetpile cofferdam held the top of the A-frame in position directly over the low point of the sump. Two short channel sections, inclosing the tops of the sides of the A-frame and bolted together, supported a three-sheave block. The pump was hung on a cable which passed through the sheave block to a hand winch attached to the base of the A-frame. This winch provided convenient hand adjustment of pump elevation.

Distance between pump and cofferdam could be increased by lengthening the anchor cable, allowing the A-frame to lean farther outward. A short section of rubber discharge hose, normally 11 ft., placed in the discharge line adjacent to the pump, provided flexibility in allowing movement of the pumping unit without moving the discharge pipe. Electrical control equipment for all four motors was mounted on the top of an adjacent cofferdam cell.

This method of mounting proved satisfactory in all respects. It eliminated the necessity of providing heavy scaffolding with supporting arrangements at successively lower levels and cranes to handle the pumps. The control of the angle of the A-frames made it easy to spot the suction pipe at the lowest point in the sump.

Pumping started on July 1, 1936. With the unwatering practically completed, heavy rains in the drainage area brought threats of high water in the Tennessee River, and the cofferdam was flooded as a safety measure. On July 7, after the flood had subsided, pumping was resumed and continued until finished. Most of the water was removed in about 12 hr. The cofferdam, made of 38 steel sheetpile circular cells 48 ft. in diameter, spaced 52 ft. c. to c. and connected by short arc diaphragms of steel sheetpiling, inclosed an area of slightly less than 12 acres. Cofferdam cells were filled by hydraulic dredging.

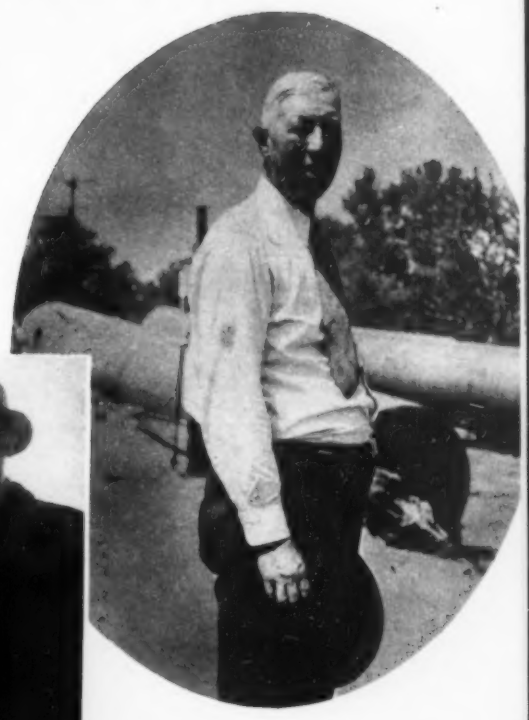
Arthur E. Morgan is chairman and chief engineer of the Tennessee Valley Authority. C. A. Bock, assistant chief engineer, is in direct charge of engineering and construction on TVA dams. T. B. Parker is chief construction engineer; Ross White, general construction superintendent; C. H. Locher, construction consultant; and A. J. Ackerman, construction plant engineer. For Chickamauga Dam, Lee G. Warren is project engineer; James B. Hays is construction engineer; and E. M. Whipple is construction superintendent.

TILTING TIMBER A-FRAMES *(in oval)* support blocks and tackle on which four vertical centrifugal pumps are suspended in 12-acre lock cofferdam at Chickamauga dam. Lines are reeved through blocks of supporting tackle to hand winches, anchored to bases of A-frames, which control lowering of pumps as water level drops during unwatering of cofferdam.

Present and Accounted For— A PAGE OF Personalities

NEW RECLAMATION COMMISSIONER

JOHN C. PAGE meets with official staff during last week of January at U. S. Bureau of Reclamation offices in Washington, D. C., to outline work for this year. *(Left to right, seated)* H. W. BASHORE, construction engineer, Casper-Alcova project, Casper, Wyo.; RAYMOND F. WALTER, chief engineer, Denver, Colo.; MR. PAGE, commissioner, Washington, D. C.; JACK N. SAVAGE, chief designing engineer, Denver, Colo.; *(standing)* WALKER R. YOUNG, construction engineer, Central Valley project, Sacramento, Calif.; FRANK A. BANKS, construction engineer, Grand Coulee dam and Columbia Basin project, Coulee Dam, Wash.; R. B. WILLIAMS, construction engineer, All-American canal and Gila Valley projects, Yuma, Ariz.; RALPH LOWRY, construction engineer, Boulder dam. Boulder City, Nev.



BRIDGE MODERNIZERS

Personnel *(right)* on installation of new concrete roadway for Queensboro bridge, New York City (described elsewhere in this issue) includes: *(left to right)* T. CLARKSON, city inspector; S. HAMBURGER, engineer in charge for Department of Plant and Structures; WILLIAM TREACY, WPA project superintendent; J. J. GRAHAM, general superintendent in charge for WPA.

SUBSTRUCTURE WORK

at Middletown-Portland, Conn., bridge across Connecticut River is directed by A. R. TERWILLIGER, superintendent, for Merritt-Chapman & Scott Corp., contractor. Steel shell caissons for bridge pier foundations are spun to rock by Montee-Atwell rotary machine at depths as great as 162 ft.

CHICKAMAUGA DAM

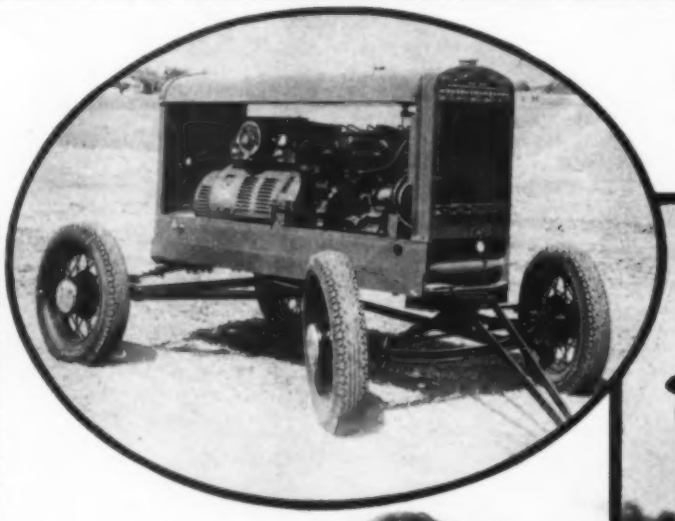
one of big TVA projects on Tennessee River, several miles upstream from Chattanooga, Tenn., is making rapid progress under direction of this group of construction men: *(left to right, above)* JAMES HAYS, construction engineer; LEE G. WARREN, project engineer; and F. C. SCHLEMMER, construction superintendent.

NEW YORK STATE BUILDERS

gathered for annual convention at White Plains, Jan. 14 and 15, discuss association program for 1937. Seated in hotel lobby are five officers: *(left to right)* VERNE WELLS, Elmira, second vice-president; HENRY C. FEIST, Buffalo, president for 1937; THOMAS H. COLE, White Plains, retiring president; GEORGE J. MACK, Niagara Falls, first vice-president; and HARRY C. TAYLOR, Rochester, secretary-treasurer. — *Westchester County Publishers Photo.*

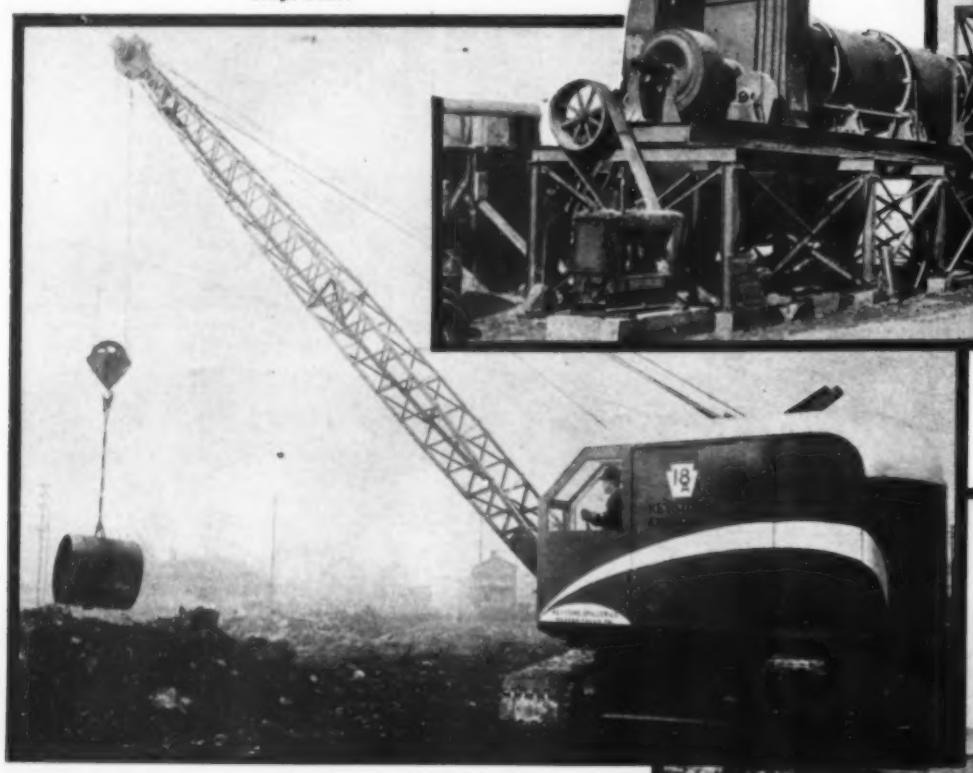
Construction Equipment News

Review of Construction Machinery and Materials for March, 1937



SELECTIVE MOTOR HORSEPOWER CONTROL (right) is outstanding improvement in new electric arc welders and results in saving of one-third usual current required in starting machines. Possible to use equivalent of motor of one-half the power rating for welding in ranges up to one-half to two-thirds rated capacity of generator. Advantages: (1) Welding current costs cut 30 to 50 per cent in average work; (2) power company penalties for poor power factor of equipment are avoided; (3) expensive re-wiring of many plants eliminated; (4) idling and light load power losses cut in half. Simple operation requires one hand only. Available in models from 75 amp. (1½ to 3 hp.) to 600 amp. (20 to 40 hp.). — **The Hobart Brothers Co., Troy, Ohio.**

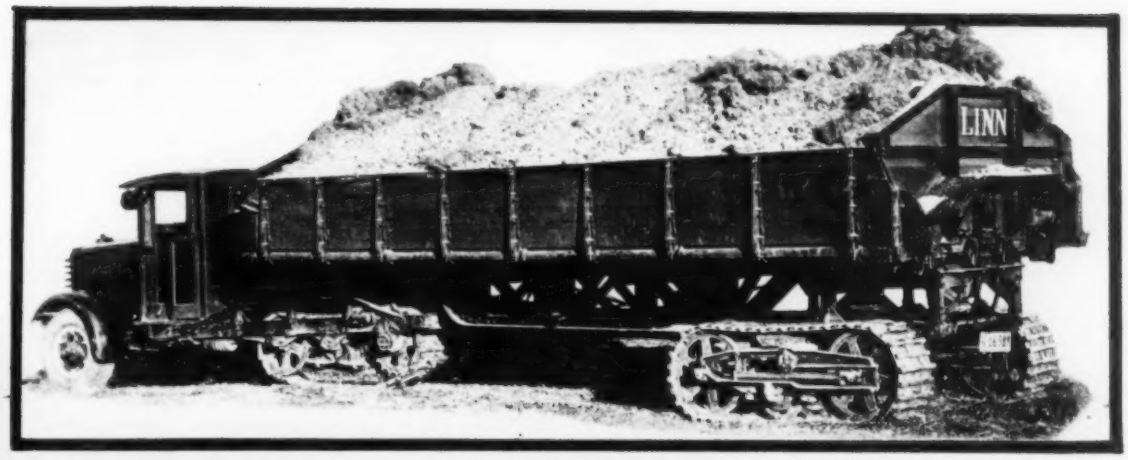
PORTABLE BITUMINOUS MIXING PLANT (below) for use in improving secondary roads consists of dryer and screening and mixing units designed to comply with highway loading and clearance regulations. Built for transportation to location on flat bed trucks or trailers. Entire plant can be erected by three or four men in one or two days without use of outside crane or rigging. Other features: S.K.F. bearings throughout; fully inclosed vibrating screen; steam-jacketed, steam-operated steel mixer; large size combustion chamber and dust collector. Separate gasoline, electric or diesel units provided on dryer, mixer and screen. Mechanical filler dust-handling equipment, dial scales, steam-jacketed asphalt bucket and timelock furnished, if desired. — **Hetherington & Berner, Inc., 701-745 Kentucky Ave., Indianapolis, Ind.**

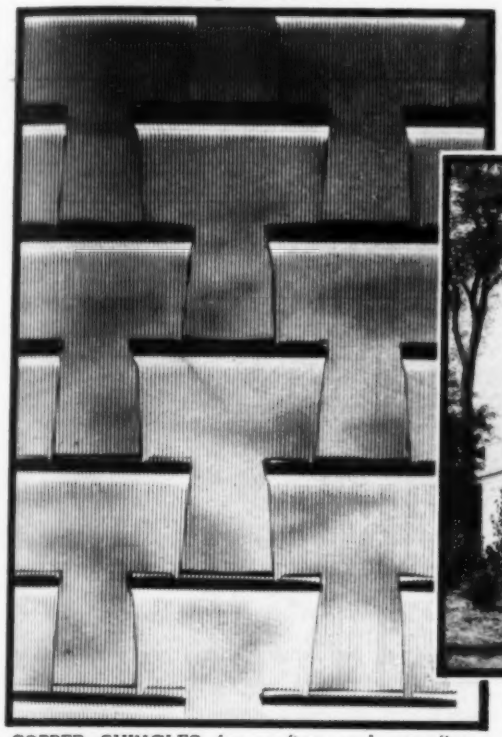


1-YD. FULL-REVOLVING EXCAVATOR adaptable to trench hoe, dragline, skimmer and crane operation is said to combine "touch," "feel," and "cushion" of steam machine with compactness, economy and convenience of gasoline, diesel or electric power. Other advantages: (1) Convenient grouping of controls assures ease and speed of handling; (2) short tail swing facilitates operation in cramped quarters; (3) low ground pressure permits progress in soft footing; (4) planetary swing mechanism for travel, rotation (at any desired speed up to 5¼ r.p.m.) and main drum operations; (5) oversize clutches. — **Keystone Driller Co., Beaver Falls, Pa.**

PORTABLE, MULTI-PURPOSE HOIST (below) single drum, is powered by either 8 or 15-hp. gasoline engine, has rope capacities up to 2,000 ft. of 5/16-in. rope and lifting capacities as high as 2,750 lb. at 120 f.p.m. Other outstanding features: (1) Maximum portability — can be moved on skid-type base or on truck or trailer; (2) easy starting with high tension magneto, automatic choke release and friction-type clutch; (3) simple but flexible operation and control; (4) heavy-duty, four-cycle, air-cooled engines for dependable power; (5) hoist unit equipped with ball bearings. — **Sullivan Machinery Co., Claremont, N. H.**

TRACTOR-TRAILER (right) of 25-30-yd. capacity for contracting, mine stripping and other haulage jobs, or for log hauling operations. Combines standard tractor chassis with specially designed trailer unit. Trailer body is two-way dumping with heavy-duty underbody hoists and automatic down-fold side gates. Dumping angle, 50 deg. Also furnished with platform and stake bodies for general hauling or logging bunks for log transportation. Powered with six-cylinder, 610 ft.-lb. torque Hercules gasoline engine. Diesel power optional. — **Linn Mfg. Co., Morris, N. Y.**





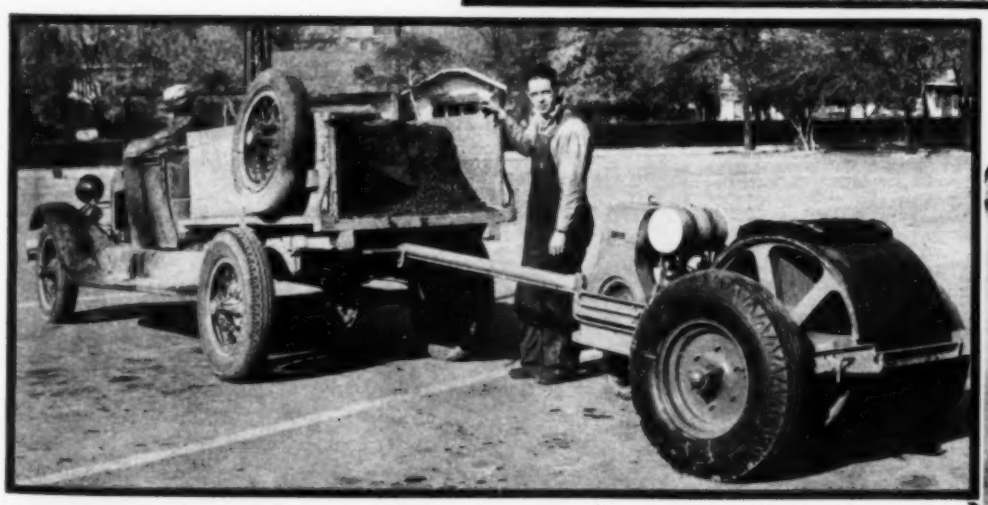
COPPER SHINGLES for roofing and reroofing beautiful homes (above, right) and impressive edifices are made of sheet copper ribbed and corrugated with ribs running lengthwise (above). Bottom edge is in form of roll giving shingle thick butted effect and acting as snow guard in winter. These shingles (1) are durable — outlasting building when properly laid; (2) provide dead air space underneath, assuring maximum insulation value; (3) are easy to apply — may be nailed over old wood or composition shingles; (4) are fireproof; (5) are weathertight; (6) are expansion-proof; (7) furnish ideal lightning protection with adequate grounding; (8) may be had in four finishes for use in varied color schemes. Made in three weights, 29-, 30- and 32-B&S gage. Length 15 in.; widths, varied. Sample package of shingles showing actual colors sent to architects, contractors and home owners upon request. — **New Haven Copper Co., Seymour, Conn.**

If You Want Further Information

Within the space limits of these pages it is impossible to present complete information about the products illustrated. If you want further details, write for them to

THE EDITOR
CONSTRUCTION Methods and Equipment
330 West 42nd Street, New York, N. Y.

DUAL GRAVEL CRUSHING AND SCREENING PLANT (below) for handling 100 to 200 tons per hour, consists of jaw crusher, 30x16-in. roll crusher, 4x8-ft. double-deck gyrating screen and sand rejector, mounted on heavy-duty goose-neck type six-wheeled truck with twelve pneumatic tires. Feeder belt conveyor, 52 ft. by 24 in., delivery belt conveyor, 52 ft. by 18 in., and 21-yd. steel jackleg bin complete assembly. — **Universal Crusher Co., Cedar Rapids, Iowa.**



MOTORIZED WHEELED ROLLER rides to job as trailer on pneumatic tires behind truck which carries men and material. Upon arrival operator lifts tongue up and over and converts unit into roller (right), cranking air-cooled gasoline engine and guiding roller back and forth over areas to be rolled. Roller travels forward and reverse at speed of from 1 to 2½ m.p.h. Drum 24-in. wide, 32 in. in diameter. Weight, 3,250 lb. Compaction, 135 lb. per inch. Engine, mounted on independent frame, remains stationary regardless of position of main frame. Especially suited to maintenance of highways and streets and work on small jobs. — **Wheeled Roller Corp., San Antonio, Texas.**

½-YD. SHOVEL (left) attains increased speed in keeping with other faster construction equipment by use of 32 roller bearings in mechanism of swing shaft, hoist and crowd shafts, and by application of molded friction clutch lining. These improvements increase speed of shovel, cut dumping and loading time 10 per cent and eliminate all grabbing, chattering, rapid wear on clutch facings, and time necessary to replace worn bushings. All hoisting, swinging, crowding, traveling and steering operations performed through three main assemblies and one shaft assembly in lower deck. Power-operated bucket trip. Operator handles all controls from seat, increasing efficiency. Other features: (1) independent cable or chain crowd; (2) two travel speeds in both forward and reverse — low gear for 30 per cent grades and high gear for speeds up to 132 f.p.m.; (3) modern style cab. — **Byers Machine Co., Ravenna, Ohio.**

Construction Equipment News

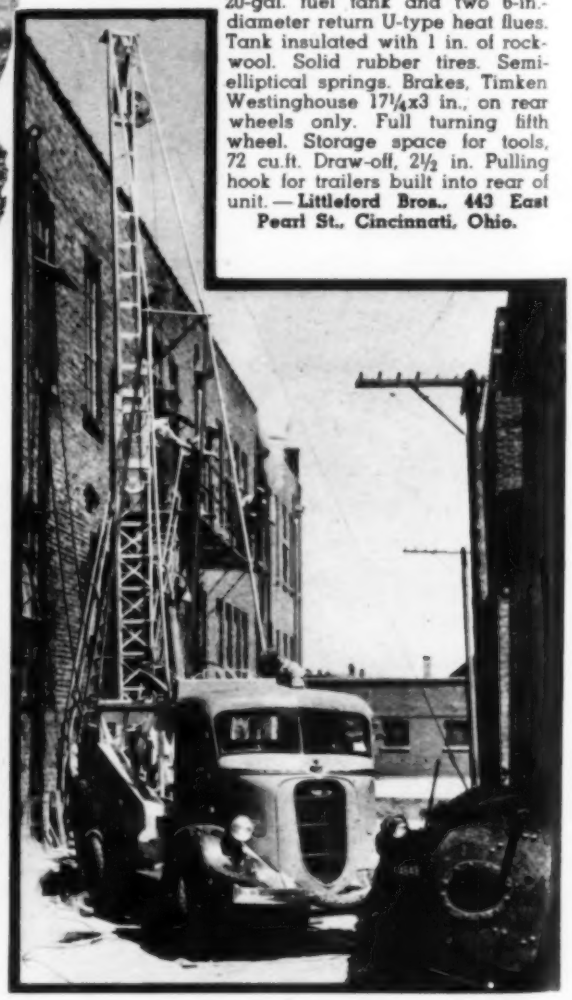
(Continued)

COMBINATION BITUMINOUS SUPPLY TANK AND TOOL BOX built for city of Cincinnati for use of street repair gangs. Will heat 550 gal. of asphalt from cold start in 90 to 100 min. Then burner can be turned off and hot stuff drawn off all day without further heating. Holds all paving tools, eliminating service truck. Saves space in congested areas; also, services of watchman, as all parts are under lock and key. Actual capacity, 580 gal. Elliptical in shape. Overall length of body, exclusive of pulling bar, 13 ft. 11 in. Approximate weight empty, 6,500 lb. Heating unit consists of two No. 5 torch burners, 20-gal. fuel tank and two 6-in.-diameter return U-type heat flues. Tank insulated with 1 in. of rock-wool. Solid rubber tires. Semi-elliptical springs. Brakes, Timken Westinghouse 17¼x3 in., on rear wheels only. Full turning fifth wheel. Storage space for tools, 72 cu.ft. Draw-off, 2½ in. Pulling hook for trailers built into rear of unit. — **Littleford Bros., 443 East Pearl St., Cincinnati, Ohio.**

RACHET LEVER HOIST (right) ranging in capacity from ¾ to 6 tons and weighing 14 to 65 lb. for use in highway and building construction. Consists of steel drop-forged upper and lower hooks, malleable iron frame casting, sprocket and ratchet shaft, control lever for raising and lowering load, heat-treated chain, "safety-valve" handle, swivel for hook and safety lug. Useful for pulling form pins on highway construction and for shifting track, changing screens, clutch and transmission work on cranes and derricks, pulling and assembling steel structures, pulling up guy wires for boom poles, stretching guard rails, laying and pulling pipe, pulling cars and tractors out of mud or heavy snow banks. — **Coffing Hoist Co., 313-319 Van Buren St., Danville, Ill.**

MOBILE WAGON CRANE mounted on six pneumatic or solid tires and powered by gasoline, diesel or oil engine. Propels self at 2 to 6 mi. per hour, or propelling mechanism may be disengaged and crane towed behind truck at high speed. Has relatively short turning radius and is operated entirely by one man who from his seat in cab controls traveling and steering as well as crane operations. With no change back of boom feet other than drum lagging crane will handle hook block, clamshell or dragline bucket, shovel dipper, back hoe or piledriver leads. Booms 20 to 40 ft. long, can lift loads ranging from 15,000 lb. at 10-ft. radius to 1,600 lb. at 40-ft. radius. — **Browning Crane & Shovel Co., 16226 Waterloo Rd., N.E., Cleveland, Ohio.**

"CAB FORWARD DESIGN" (right) of 1½- and 2-ton trucks enables them to carry maximum load on short wheelbases, thus making use possible in close quarters. Wheelbases, 101 in. for 9-ft. body; 125 in. for 12-ft. body. Special wide, drop-forged front axle for short turning. Full-floating, spiral-bevel-gear-type rear axle. Hydraulically actuated brake shoes. Propeller shaft emergency brake. Forward cab provides ample room for operator and easy accessibility to engine. Single plate 10-in. clutch. Engine, 75 hp. at 3,200 r.p.m. Cooling system, 4-gal. capacity. Metal spoke wheels, standard equipment; disk wheels available. — **Studebaker Corp., South Bend, Ind.**



Construction Equipment News

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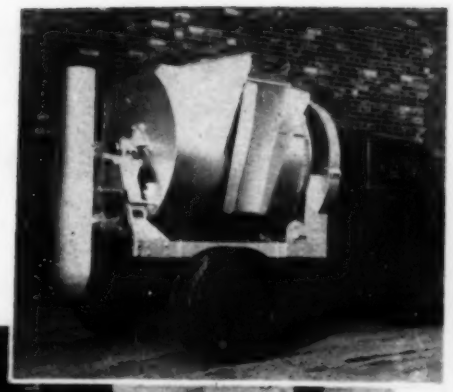
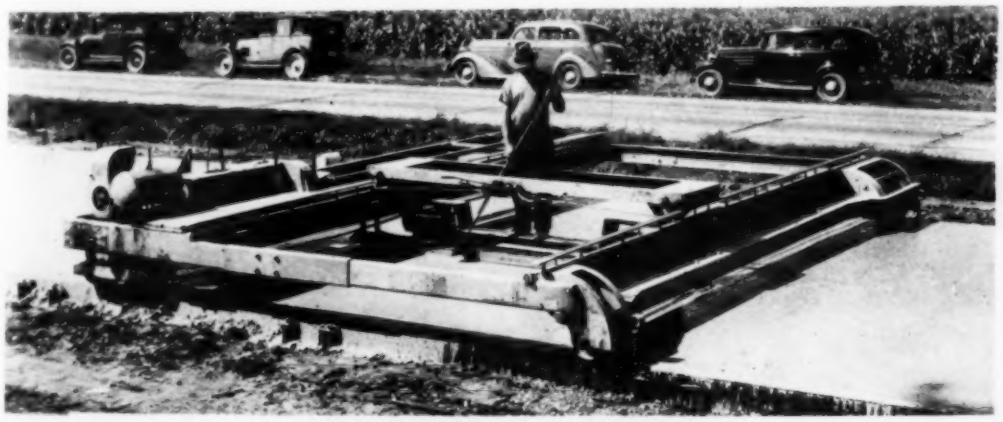


OPEN-TOP TRANSPORT MIXER

of all-steel construction, built in sizes of 1 and 1½ cu.yd. for mounting on light trucks, is designed for both side and rear end discharge. Open at top for easy charging and cleaning with hose at end of day's work. Drum tilts for side discharge, as illustrated; rear end discharge is through chute. Mixing is done by revolving helical blades, with replaceable rubber inserts, driven by power takeoff from truck engine — no separate motor for mixing. Variable mixing speeds from 1 to 20 r.p.m. Cut steel gears fully housed in oil bath. Shipping weight, 3,000-3,400 lb. Side discharge applicable to building operations, sidewalks and pavement widening; rear end discharge for concrete floors and driveways. — Concrete Transport Mixer Co., 650 Rosedale St., St. Louis, Mo.

AIR-DRIVEN VIBRATORS

For heavy, mass concrete, Model 518, with air motor at upper end of short rigid tube—weight, 65 lb.; frequency, 7,000 vibrations per minute; capacity, 35-40 cu.yd. per hour; air consumption, less than 80 c.f.m.; recommended operating pressure, 80-100 lb.; overall length, 4 ft.; vibrating tube, 5½ x 15 in. For structural work employing concrete of less than 3-in. slump, Model 325, with air motor inclosed in 3 x 25 in. vibrating tube — weight, 45 lb.; frequency, 8,000 v.p.m.; capacity, 20-25 cu.yd. per hour; air consumption, less than 65 c.f.m.; recommended operating pressure, 90-100 lb. — Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.

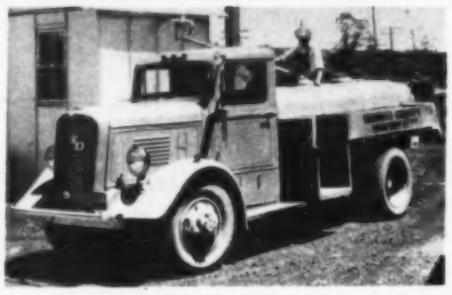


LONGITUDINAL FINISHER

propelled by gasoline motor gives final mechanical finish to concrete slab by longitudinal back-and-forth movement of screed traveling transversely across pavement while machine oves forward. Templet track for rollers supporting screed carriage is adjustable to specified crown. Slight angle to screed works excess concrete forward, away from finished section. — Koehring Co., 3026 W. Concordia Ave., Milwaukee, Wis.

Construction Equipment News

(Continued)

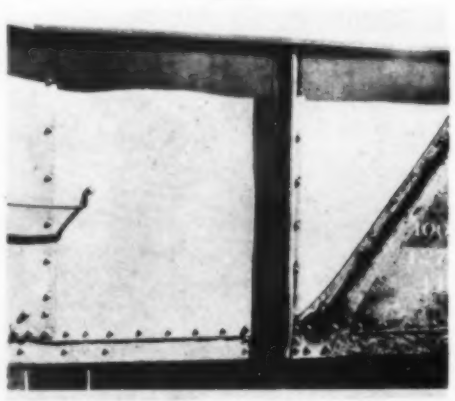


OIL DISTRIBUTION UNIT

has speeded up fuel servicing in Waupaca County, Wis., about 100 per cent. From its gasoline bulk station at Waupaca, county dispatches its FWD streamlined tanker to its sixty pieces of equipment operated in road building, maintenance, snow removal and other operations. Truck tank holds 600 gal. and is equipped with automatic measuring pump whereby any amount of gasoline can be dispensed. This feature plus capacity of truck for speed and quick maneuverability has saved much expense and delay in handling county's gasoline requirements totaling 267,000 gal. yearly. Under old system fuel was distributed in 5-gal. cans carried on slower units. — Four Wheel Drive Auto Co., Clintonville, Wis.

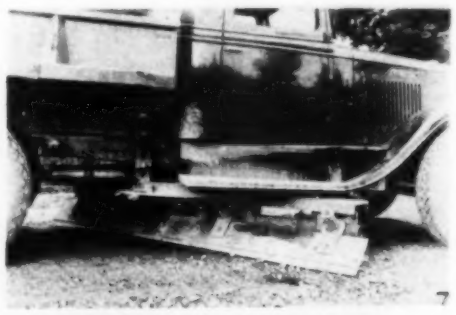
RUBBER PUTTY

was used for glazing steel sash used in sawtooth roof of new automobile assembly plant of General Motors of Mexico. Plastikon putty adheres to steel, wood or glass and, because of its low oil content, requires no mixing prior to application. Chosen for this job because, although solidifying and shrinking slightly, it does not crack in shrinking nor become brittle in extreme heat and dryness. Elastic even after applying and protects glass against breakage resulting from slight weaving or warping of steel sash. — B. F. Goodrich Co., Akron, Ohio.



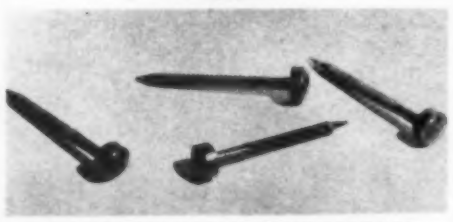
PROTECTIVE COATING

Coppercote seals surfaces of iron and steel against corrosion, of wood against attack by borers and of concrete against water leaks. Special vehicle carries minute flakes of pure metallic copper in suspension. When applied, copper particles adhere to base while vehicle rises and forms second protective film, permitting use of colors in vehicle. Material stops further corrosion of ferrous metal already rusted. After 15 months exposure on two panels of rusted gondola car, in photograph, coated surface remains hard and unbroken. Scale was chipped off and corrosion burned prior to application. — American Coppercote, Inc., 480 Lexington Ave., New York, N. Y.



HYDRAULIC SCRAPER

Mounted by J-bolts (requiring no holes in truck frame) midway between front and rear wheels. Spindle hangers provide crowning adjustment. Hydraulic pressure pump in cab lowers blade to road surface. Release valve raises it to clear 8 in. Blade suspended from adjustable semi-circles permitting angles up to 45 deg. Blade arm units hinged and locked to prevent gouging or chattering. Two models: (1) 8 or 9-ft. blade for 1½-ton trucks, and (2) 10-, 12- or 14-ft. blade for heavier trucks. — Monarch Road Machinery Co., Grand Rapids, Mich.



LEAD-HEAD ANCHOR NAIL

for galvanized roofing. Anchor rings on shank possess advantages over screw threads. Head does not twist off in driving. Nail cannot twist out backwards. — W. H. Maze Co., Peru, Ill.

85-FT. BOOM ON TRUCK CRANE

Jib 35 ft. long added to 50-ft. boom of P&H crane by Matt Sullivan, New York City contractor. Low center of gravity on truck with 35-in. wheels; top of sub-base just 43½ in. above street. — Harnischfeger Corp., Milwaukee, Wis.

News from Manufacturers
ABOUT THEIR PRODUCTS

The publications reviewed below will keep you posted on latest developments in construction equipment and materials available for your use. If you want copies, ask for them.

SAFETY EQUIPMENT — **Mine Safety Appliances Co.**, Pittsburgh, Pa. (124 pp., illustrated). Catalog 5A covers safety equipment for mining and tunneling work, including mine lamps, blasting units, carriers for detonators, skullguard hats, respirator filters for dust, oxygen apparatus, safety belts, gloves, goggles, welders' helmets, safety shoes, first-aid kits. A second catalog, No. 5B, (127 pp., illustrated) deals with industrial safety equipment, covering gas masks, hard micarta hats, goggles, etc.

• • •

ARC WELDER — **Hobart Bros.**, Troy, Ohio. (24 pp., illustrated). New 40-volt simplified electric arc-welding equipment. Designed for constant stable arc and close control of current and voltage for different welding ranges. Remote control by operator. Electric motor and gasoline engine drive. Design details described and illustrated with many photographs of application. Standard and special welding accessories. Welding electrodes.

• • •

WELLPOINTS — **Griffin Well Point Corp.**, 725 East 140th St., New York, N. Y. (4-page folder, illustrated). Two types of self-jetting well points, (1) nozzle and (2) jet-and-drive. Non-clogging in fine material. Screens have "interflow" feature, with perforated corrugated separators around riser pipe to prevent blockage. Well-point pump in 6- 8- and 10-in. sizes; electric or gas drive.

• • •

WIRE ROPE BLOCKS — **Sauerman Bros., Inc.**, 438 S. Clinton St., Chicago. (8 pp., illustrated). All-steel Duralite wire rope blocks; sizes 6 to 42 in. Bronze or roller bearings in single and multiple-sheave types. Straight and wide throat. Swivel eye or hook.

• • •

ASPHALT ROADS — **The Texas Co.**, 135 East 42nd St., New York, N. Y. (18 pp., illustrated). Information for highway engineers and contractors on low-cost, intermediate types of Texaco asphalt surfacing, including road-mix, plant-mix and surface treatment. Step-by-step construction procedure is described and illustrated. Tables give, for road widths of 8 to 18 ft., amounts per mile and per square yard, of asphaltic surfacing material, stone and sand required. Materials include rapid-curing, medium-curing and slow-curing, referring to evaporation of volatile ingredients.

• • •

STATIONARY DIESELS — **Western Engine Corp.**, 1000 Alhambra Ave., Los Angeles, Calif. (8 pp., illustrated). Heavy-duty, four-cycle, solid injection, cold starting diesel engines in sizes from 53 to 700 hp. Units from 2 to 8 cylinders. Specifications and table of comparative costs of driving 100-hp. unit by electric motor, steam, gas and diesel fuel.

• • •

WELDING GENERATORS — **Westinghouse Electric & Mfg. Co.**, East Pittsburgh, Pa. (bulletin No. 26-120, 8 pp., illustrated; bulletin No. 26-150, 10 pp., illustrated). Bare generators and electric-motor-driven and gasoline-engine-driven generators of 200, 300, and 400 amp. Portable and stationary models. Preset single-dial current control and automatic voltage control.

• • •

OXWELDED PIPE LINES — **Linde Air Products Co.**, 205 East 42nd St., New York. (30 pp., illustrated). A practical treatise on approved methods and equipment for constructing steel pipe lines from 4 to 26 in. in diameter. Multi-flame Lindewelding, introduced in 1934, increases ease and efficiency of making rolling welds. Text describes and illustrates construction practice on range of specific jobs, principally oil and gas pipe lines, and gives data on welding production under different field conditions. Notes on both bell-hole and rotation welding. Useful information on welding organization, with number of men required in typical welding gangs. Joint design and specifications for oxwelded pipe lines.

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- Insley Type "K-10" shovel gives contractors the maximum in 3/8 cubic yard shovel performance at low operating costs.

Independent crawler control.
Crawler shoes of high carbon steel with high center-track design.
Roller type drive chain with self cleaning sprockets.
Full revolving frame of all-welded construction with hook-under rollers.
Insley Patented Crowd.
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For time saving and extra profit . . . specify Insley Type "K-10" Excavator.

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YELLOW TRUCK & COACH MANUFACTURING COMPANY, PONTIAC, MICHIGAN

FASTER DISCHARGE!

MERELY TILT and POUR

The Smith Tilter is the fastest discharging mixer in the industry. You merely tilt the drum and let gravity pour out the entire batch — the quickest and most practical way of emptying a mixer drum, just as it is the quickest and best way of emptying a pail of water.

Other types of mixers LIFT the material and thus use power to discharge the batch. Why not use gravity, like the big Smith Tilters have done and are doing on huge projects such as BOULDER DAM, NORRIS DAM, TYGART VALLEY RESERVOIR, FORT PECK DAM, MUSCLE SHOALS, and many others.

LIKE EMPTYING A PAIL You wouldn't think of emptying a pail with a dipper. It takes to long. The fastest, most practical way is to TILT the pail and POUR out the entire contents.

ORIGINATED BY SMITH 37 years ago, these dependable mixers have never been improved upon. During all these years, Smith Engineers have developed and perfected the design until today the Smith Tilter is universally accepted as the finest and most up-to-date high speed machine for producing big volumes of uniform concrete.

Sizes range from the 2½-S Mascot to the 112-S, the largest mixer in the world. Ask for literature.

THIS NEW CATALOG is just recently off the press. It gives you a complete description of Smith 28-S, 56-S, 84-S and 112-S Tilters. Write for your copy.

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2851 N. 32nd St. Milwaukee Wisconsin

SMITH MIXERS

THE BOULDER DAM MIXERS

1019-1-137-P14

YOU PAY

FOR EXCESS WATER IN YOUR SUBGRADES

Leading engineers now agree that fully 80 per cent of all road surface defects are caused by a wet, improperly-drained foundation. In 1936 alone, the damage caused by frost heaves, chuck holes and slides cost the public thirty-eight million dollars.

YES SIR . . . every spring you pay a heavy toll to this "Public Enemy No. 1." But don't let him bluff you. He isn't nearly as tough as he looks. Besides, experience shows that there is a way to get rid of him effectively and economically.

The way lies through a *systematic* program of subdrainage. This has been proved time and again by every highway department and railroad that has adopted it. Spring break-ups have been permanently eliminated. Traffic safety has been improved and maintenance costs have been greatly reduced. One railroad, for example, *saved 14 million dollars* the first year by installing an extensive subdrainage system of Armco Perforated Pipe.

By this same method you, too, can reduce your spring maintenance costs. Prove this fact to yourself by installing Armco Perforated Pipe under the stretches of road that are causing you trouble right now. Experienced Armco engineers are ready to give you capable and helpful assistance in solving your problems. Mail the coupon for quick action. Armco Culvert Mfrs. Association, Middletown, Ohio.

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WITH SUBDRAINAGE

ARMCO

Send complete data on subdrainage with Armco Perforated Pipe.

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- Revolving Scrapers
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- Regular Rippers
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- Compacting Harrows
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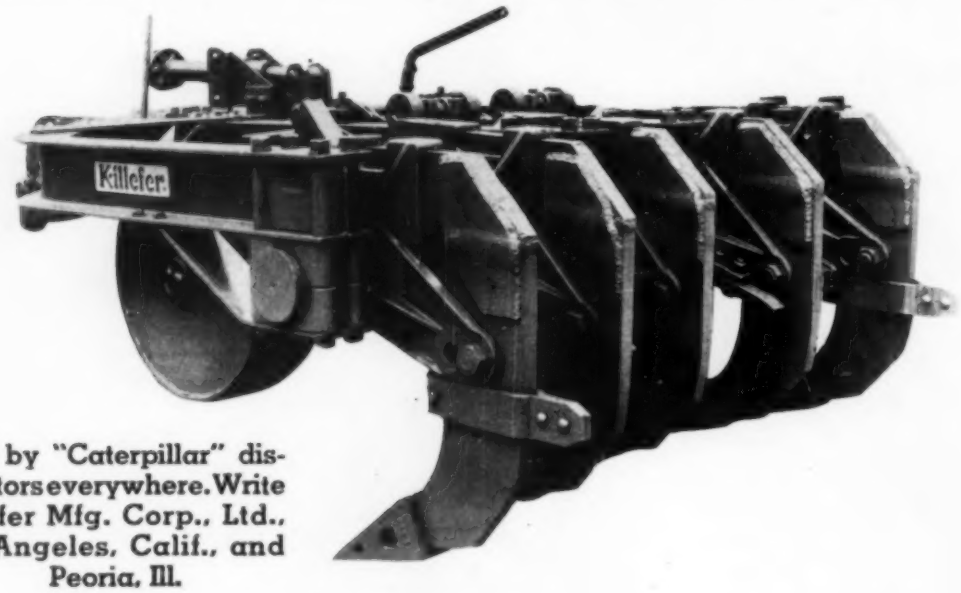
A REAL self-cleaning ripper. The tool-head rolls like a barrel to clear obstructions or stop digging. Great clearance under frame and between points (front to rear). Heat-treated standards and points. Working depth 14". Point spacing 18". One-rope control. Accurate depth adjustment. For tractors of 60 to 75 horsepower. Weight 7,580 lbs. Two smaller models. Write for folder R-64.



Sold by "Caterpillar" distributors everywhere. Write Killefer Mfg. Corp., Ltd., Los Angeles, Calif., and Peoria, Ill.

No. 170 Revolving Ripper

fast!

"FOR HIGH SPEED WORK, GIVE ME A MICHIGAN!"

I've run lots of shovels in my time and I know what a real day's work with the ordinary type means, too! That's why I'm strong for the MICHIGAN . . . For several years now, the boss has bought MICHIGAN Truck Shovels for the high speed jobs. He knows that Michigan's AIR CONTROLLED CLUTCHES are faster, and they keep his operators at top efficiency without fatigue ALL DAY . . . Fingertip Air Controls are not new with the MICHIGAN. Their dependability has already been proved by seven years of actual use.

AIR CONTROLS are but ONE feature — Write for the MICHIGAN DATA BOOKLET "CM" today

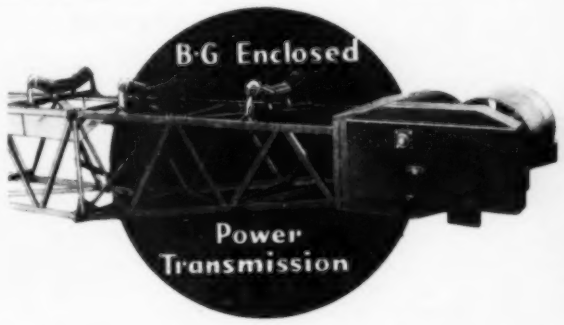
Michigan Truck Shovel — ⅜ yard capacity — 25 m.p.h. road speed.

MICHIGAN POWER SHOVEL CO.
MILLER ROAD
BENTON HARBOR MICH.

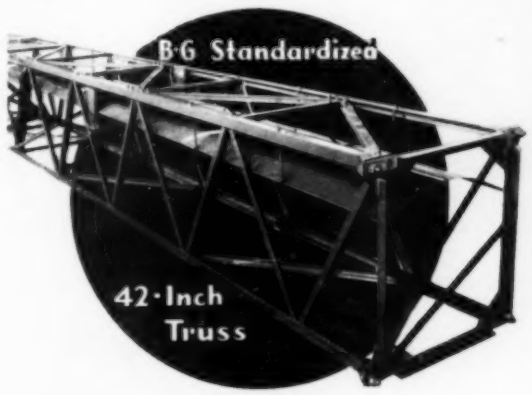
Via Barber-Greenes

Here are two new Barber-Greenes doing a perfect job in an ideal plant.

The conveyor on the right is 160′ long, with a Barber-Greene steel truss 42″ deep. This conveyor not only has fairly long spans, but carries an 8″ water pipe in addition to the walkway.



The left conveyor, which runs horizontally just above the ground, is mounted on wood stringers as no long spans are necessary.



Both conveyors are driven by the new Barber-Greene enclosed transmission, an all welded steel unit, dust tight, internally lubricated. This transmission is available in two sizes, has highest quality anti-friction bearings and precision made steel gears and sprockets.

The new Barber-Greene 42″ deep welded steel truss has all the well known B-G advantages, standardized sectional construction, quick easy erection, etc.

The carriers on both conveyors are the finest made by Barber-Greene: unbreakable, all welded steel base, end brackets die formed, oversize Shafer Self Aligning Roller Bearings. FOUR pass labyrinth grease seals keep the grease in and grit out.

The carriers alone justify your inquiry. Send a card or letter today for full information on Barber-Greene Conveyors. Remember we maintain a department for the sole purpose of solving your material handling problems the most efficient, economical way. There is no obligation.

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36-24

"FAVORITE"

Reversible Ratchet Wrench

Of course you KNOW how the "FAVORITE" Wrench, with its back-and-forth streamline ratchet motion, *never leaving the nut till the nut is tight,* speeds up nut-turning. We couldn't improve that motion, so we improved the wrench — made it of better and stronger metal — handles, heads and pawls — and gave it a CADMIUM FINISH to improve looks and protect against rust.

NO LOST MOTION

is the secret of "FAVORITE" speed. Never leaves the nut until job is done. Can be used in narrower places than an ordinary wrench. Wrench heads interchangeable in handle. Now — get full particulars about the *new* "FAVORITE" — it will pay you — send the coupon today.

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Mail this — learn why and how

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I want to know more about the new and stronger "Favorite" Reversible Ratchet Wrench. Send me full details today. I want to turn nuts — Bolt size .....Sq. .....Hex.

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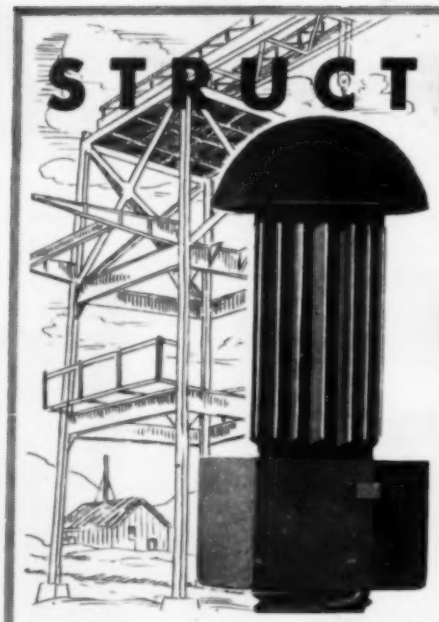

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MANGANESE STEEL GALVANIZED OR BLACK

. . . used as a practical, economical and efficient substitute for riveting, for Maintenance Purposes — Field Erection — Permanent and Temporary Construction in the erection of BUILDINGS — TANKS — TOWERS — CARS — BRIDGES. No heat — No air Required.

The Structural Rib Bolt embeds itself in the walls of the hole ensuring permanent stability and a body-bound fit. The Automatic Lock Nut is a single unit, having U. S. Standard Threads.

Approved and specified by Engineers and Architects for Federal, State, Municipal and Private projects.

On account of having U. S. Standard Threads, they are stronger and less expensive than any other type of rib bolt on the market.

Test samples ¼" to 1⅛" diameter — any *thickness of work desired* — sent at your request.

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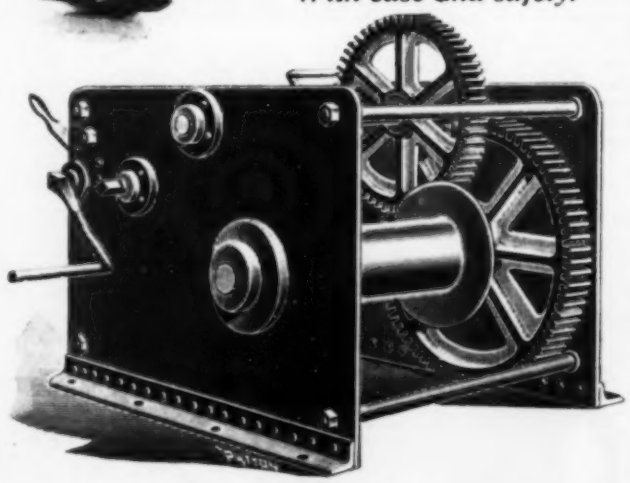
Willow St. Plant — Lebanon, Pa.

DOBBIE WINCHES

A Dobbie Winch for every purpose.
From 100 pounds to 50,000 pounds capacity on a single line.
With ease and safety.



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TRENCH HOE

a 20 foot trench in heavy clay!

25 REASONS FOR CHOOSING BAY CITY

1—Convenient economical weight.
2—Helical cut gears—noiseless, long wearing.
3—Unit (nickel-manganese) car body and machinery table, totally heat treated.
4—Frictionless bearings thruout.
5—6-cylinder power.
6—Extra large diameter swing roller-path.
7—Oversized clutches & brakes.
8—Drop forged crawler shoes.
9—Long crawlers — low bearing pressure.
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11—Swing lock—in any cab position.
12—Automatic Travel lock.
13—Extra heavy cab. Plenty inside working room.
14—Fast operating speeds.
15—Two travel speeds.
16—All steel construction.
17—Three lever control.
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19—High pressure lubrication thruout.
20—Safety worm boom hoist.
21—Separate hoist drums.
22—Internal swing teeth.
23—Unequalled steering at full speed.
24—Convertible—without machinery change.
25—Accessibility for inspection or adjustment.

Look at that smooth bank

Look at the work of this ¾ yard Bay City Trench Hoe, owned by the City of Saginaw, Michigan (Dept. of Public Works)! That fine side cutting you see on this 15 ft. wide trench was done on a City Storm Sewer Project. There's a special length boom and stick on this machine, increasing its normal depth range from 17 to more than 20 ft. Powered with a Buda Diesel Motor, this is a fine investment, *a great* all-round municipal outfit, operating as it does Shovel, Dragline and Clamshell attachments. Like all the many Bay City models, it has everything you want for profitable, speedy digging.

There are 10 models of Bay City Shovels —ranging in sizes from ⅜ to 1¼ yd. sizes. No matter what your shovel need — you'll find the answer in a Bay City, at the price you want to pay. Write for details.

Send for details

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EASTERN OFFICE ROSELLE, N. J.
BAY CITY MICHIGAN

HERE'S A LOW COST... *profitable* SCREENING & WASHING PLANT

it's a **"RELIANCE"**

Here's a plant that's a gold mine for the "small" producer — say 30 to 40 tons an hour, or 40 to 70 tons an hour. The smaller size is ideal for local demands or a small road job — the larger, for a good size road job plus some local work. The larger plant costs very little more than the smaller — and it's a fine investment.

Any piece of RELIANCE Equipment is a good investment. It's backed by 30 years of experience — not the cheapest, but unmatched for QUALITY! Let us send you Catalog and prices.

WE OFFER A COMPLETE LINE OF

Rock Crushers — Street Sweepers — Wash Boxes
Bucket Elevators — Storage Bins — Feeders
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UNIVERSAL ROAD MACHINERY CO. *KINGSTON • NEW YORK*

BLAW-KNOX (Ateco) BOTTOMLESS SCRAPERS

The Blaw-Knox (Ateco) BOTTOMLESS SCRAPER enables the contractor to operate his dirt moving job on a definite schedule and at a profit. It keeps dirt moving costs down.

BLAW-KNOX (Ateco) TAMPING ROLLERS

Tamp as you roll with a Blaw-Knox (Ateco) TAMPING ROLLER, a remarkably efficient and economical device for compacting heavy and light earth fills of every description. Meets requirements of all State and Government specifications.

Send for descriptive catalogs

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Please send:—CATALOG No. 1540—Blaw-Knox (Ateco) BOTTOMLESS SCRAPERS . . . ☐

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FOR MODERN ROADWORK

. . . at Low Cost

This plant was designed to meet the demand for the economical improvement of secondary roads. We have built several to date and they have proved their worth in actual service. No investment is needed for a running gear, plant adapted to standard flat bed truck and trailer hauling.

Some Details

- Can be erected by 3 or 4 men in a few days.
- No erection equipment required. Plant equipped with hoist and jib crane.
- Built in 2 units (dryer unit; and screening and mixing unit).
- Comply with most highway loading and clearance regulations.
- SKF bearings throughout. Fully enclosed vibrating screen. Steam-jacketed, steam-operated steel mixer. Large combustion chamber and dust collector.
- Write for Bulletin T-250.

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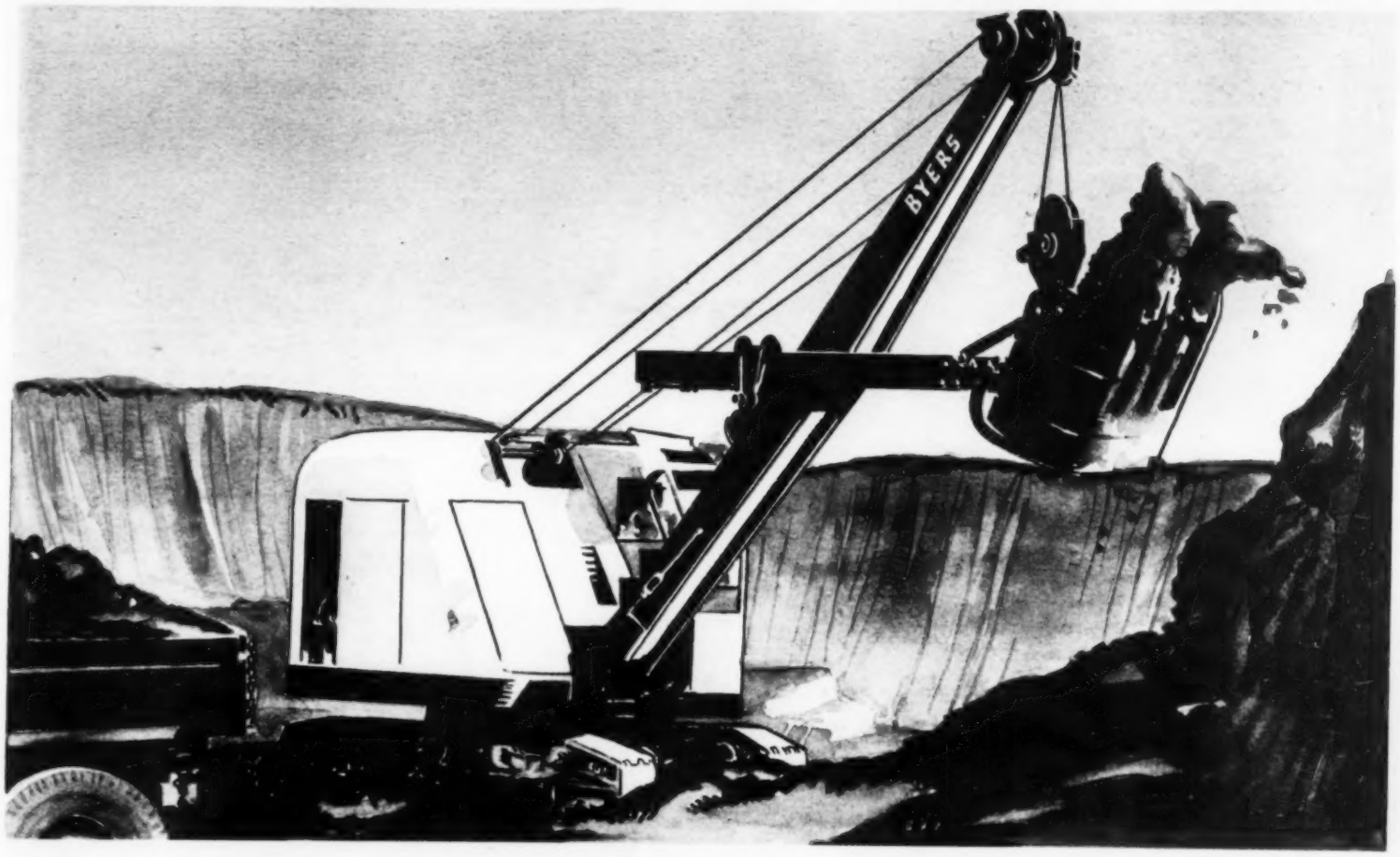
SPEED



"New Speed Era" Obsoletes "Muscle Bound" Shovels

Many shovels are like "muscle bound" circus strong men—lots of power but slow in action. Such shovels are being replaced by Byers Model "62" designed with plenty of speed and weight for toughest digging in this "new speed era". Faster planes, automobiles and trains have set the pace. All construction equipment is being speeded up. Model "62" speeds ahead with 10% faster swinging time—10% more power—power-operated clutches and dipper trip—and its own low-priced trailer for faster transportation. Write for details on this new "modern" shovel.

BYERS MACHINE COMPANY
RAVENNA, OHIO

BYERS COMPLETE LINE OF SHOVELS AND CRANES

Bear Cat Jr. (¾ swing)	⅜ Yd.
Model 55	⅜ Yd.
Model 62 (shown above)	½ Yd.
Model 66	⅝ Yd.
Model 80	¾ Yd.
Model 100	1 Yd.
Model 125	1¼ Yd.

BYERS MODEL "62"

"YEAR AHEAD" ECONOMY, PERFORMANCE AND DESIGN

Sterling CONTRACTORS EQUIPMENT

The most dependable equipment we have ever used.

A. H. Kurtz of Massman Const. Co.

Sterling meets the most exacting demands — Simple, Rugged Construction — Non-clogging Trash type — Patented priming action — Dependable, long life performance.

Choose Sterling — the pump used and recommended by leading contractors everywhere. Follow the lead of Massman Construction Co. and many others who have standardized on Sterling.

Ask today for new Contractors Catalog No. 37 and new price list.

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Hoists
Generating Plants
Saw Rigs

STERLING QUALITY

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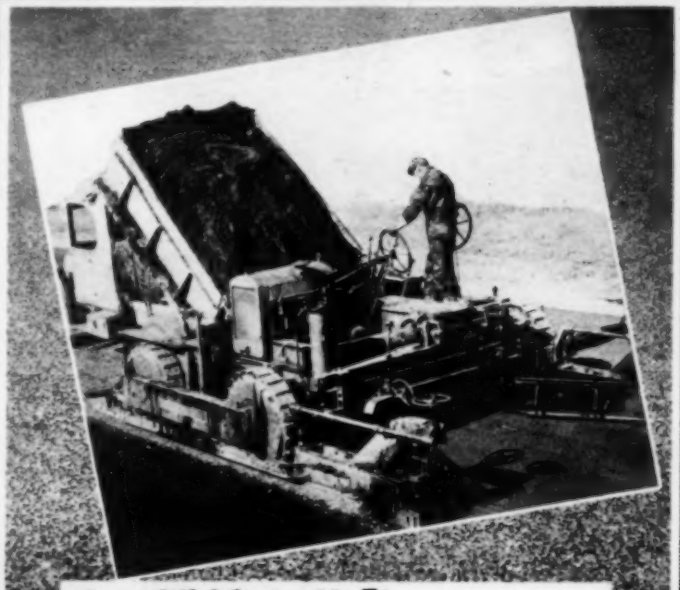


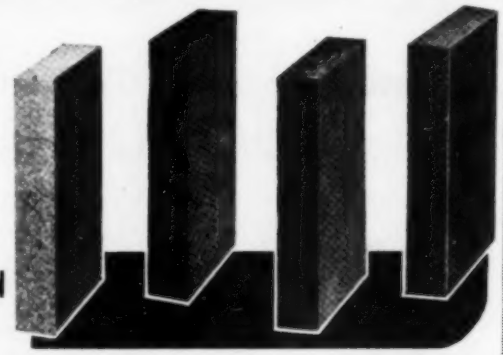
Any Width to 14 Ft.--
Laid Smooth as Velvet--
Faster than Your Plant Can Mix

With its 18 ft. straight-edge runners to equalize the surface, its semi-crawler traction all on hard subgrade, its pug-mill spreader, its ability to blend smooth joints and adjustability up to 14 ft. widths--the *Jaeger Paver* lays precision smooth pavements, faster and at lowest known cost. Send for Catalog and Prices.

THE JAEGER MACHINE CO. 800 Dublin Avenue Columbus, Ohio
World's Largest Builder of Spreading and Finishing Machines

JAEGER *bituminous* **PAVER**

EXPANSION JOINTS FOR HIGHWAY CONSTRUCTION BY



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Servicised Products Corp.
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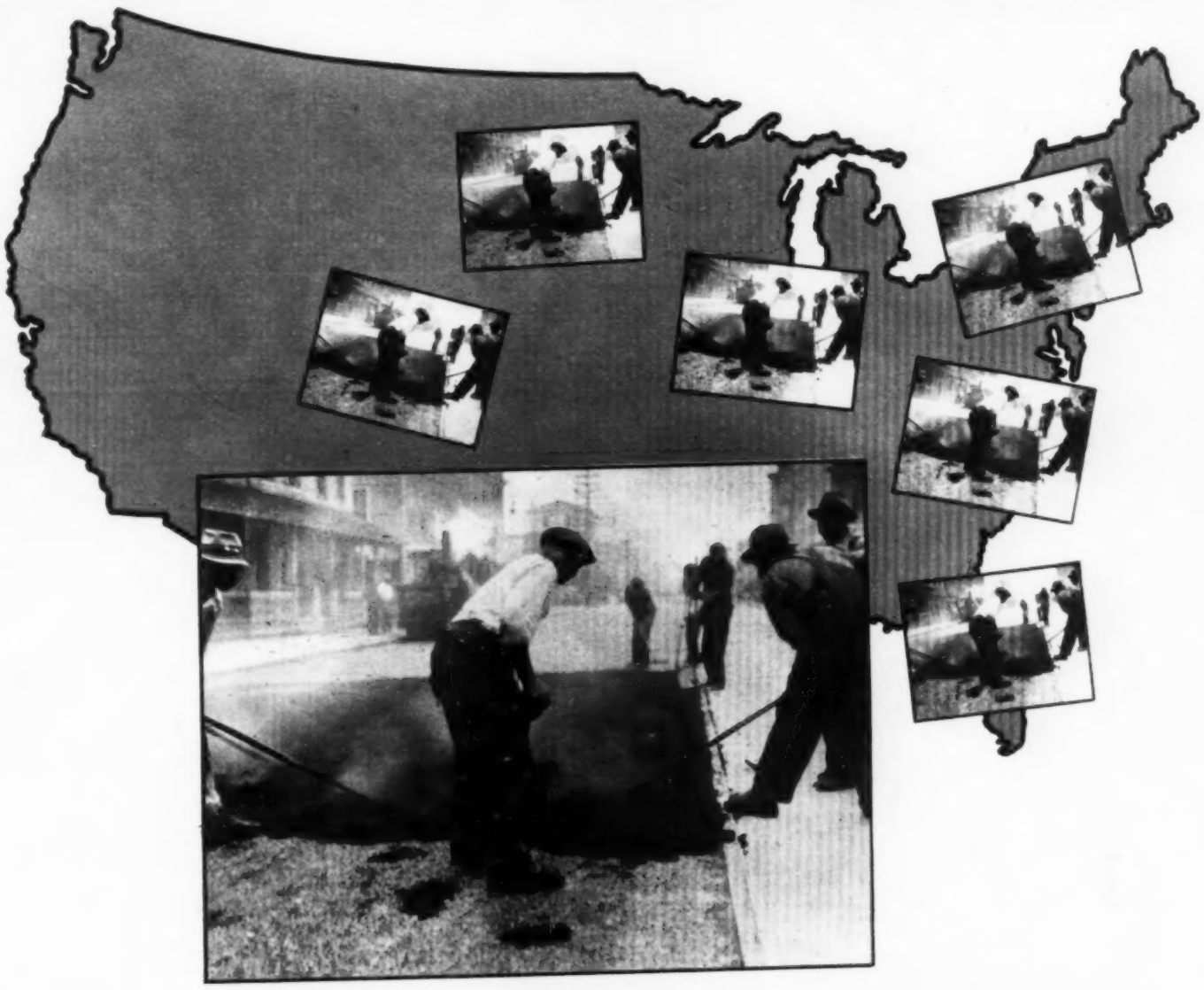


THROUGHOUT MOST OF THE COUNTRY THE SAME SCENE WAS BEING ENACTED

As this paving gang laid Atlantic City's newest TEXACO Sheet Asphalt pavement last year, three other gangs were constructing TEXACO streets on the Texas Centennial Grounds in Dallas,—at the foot of Pike's Peak in Colorado Springs, Colo.,—and in the city of Chicago.

Between these four widely scattered points—simultaneously—thousands of miles of other streets and highways were being surfaced with TEXACO Asphalt.

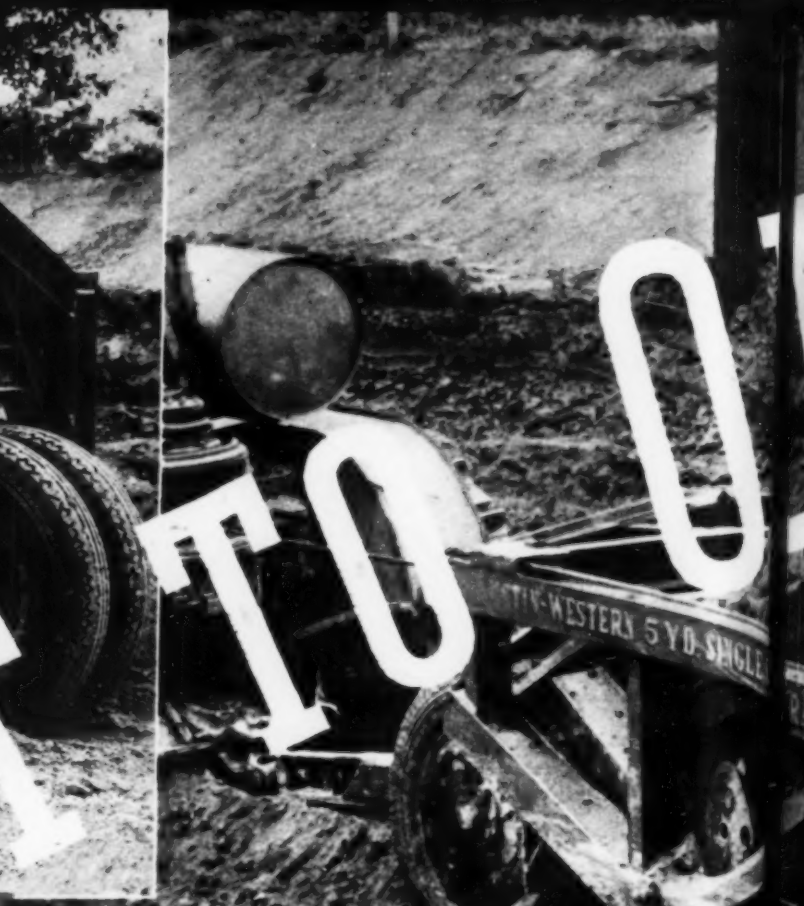
Last year and for a quarter-century prior to that, choice of TEXACO Asphalt for street and highway projects extended from the Atlantic Coast all the way across to the Rockies, from the Great Lakes to Mexico.

TEXACO

ASPHALT

THE TEXAS COMPANY, Asphalt Sales Department, 135 East 42nd Street, New York City

CHICAGO CLEVELAND KANSAS CITY HOUSTON DALLAS BUFFALO PHILADELPHIA RICHMOND BOSTON JACKSONVILLE



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"Best Equipment INVESTMENT WE HAVE MADE" Says THE TROYER CONTRACTING CO.

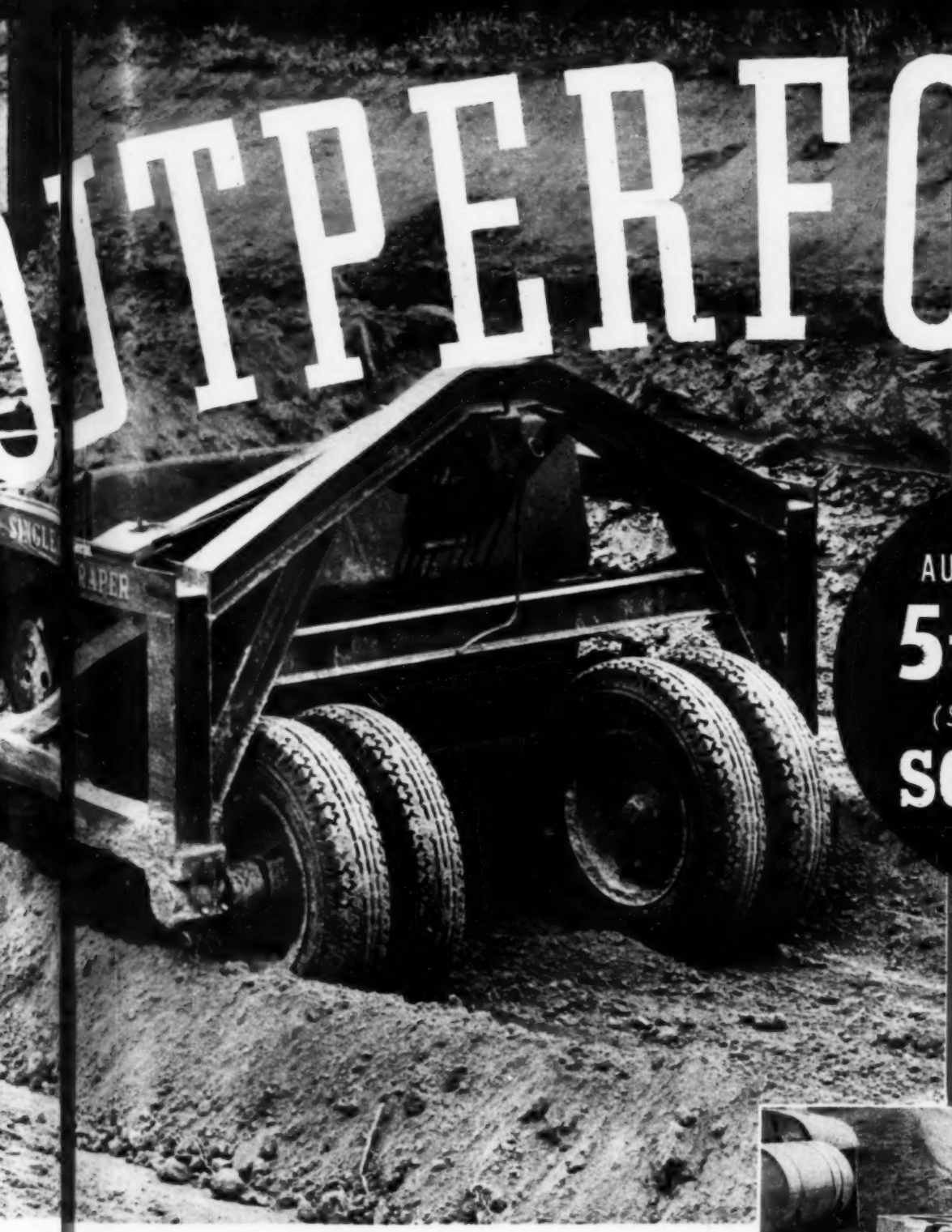
● The Austin-Western 5-yard single-cab Scraper is built to dig, haul and spread faste Every operation is completed more quickly more accurately. Operator has less to do more time to step-up capacity. One cable, one lever co trols all loading, carrying and dumping.

"In our ten years of experience and in the purchase more than $75,000 worth of grading equipment," says M Roy Troyer, President and General Manager, The Troy Contracting Co., Andover, Ohio, "this scraper is the be equipment investment we have made. We have used near

THE AUSTIN-WESTERN ROA

AUROR

UTPERFORM



AUSTIN-WESTERN

5-YARD

(SINGLE-CABLE)

SCRAPER

every other make of scraper, but we have never seen a machine do the work as satisfactorily as this one."

With an overall width of less than eight feet, the Austin-Western 5-Yard Scraper is as flexible as it is fast and economical. It will load and dump to grade . . . bulldoze and level when necessary . . . operate near edge of fill . . . can be towed by truck from job to job. Rugged construction makes for long life and low upkeep . . . compact, easy-to-mount, power winch (weighing but 400 lbs.), fits all makes of tractors. Check and mail coupon for full details.

The Austin-Western Road Machinery Co., A-6, Aurora, Ill.

- ☐ Send a salesman. Tell me more about
- ☐ 5 Yd. Scrapers
- ☐ Motor Graders
- ☐ Road Rollers & Roll-A-Planes
- ☐ Blade Graders
- ☐ Motor Sweepers
- ☐ Snow Plows
- ☐ Elevating Graders
- ☐ 12 Yd. Scrapers
- ☐ Rippers & Scarifiers
- ☐ Shovels and Cranes
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S-714

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A MACHINERY CO.

OF ILLINOIS

"ALL SET"

for anything with this Snap-on set!

KEEP GOING WITH Snap-on Tools

No. 475 Master Mech Socket Wrench Set
(illustrated)

Here is a tool shop in one hand, carried right to the job. A place for each tool, and every tool in its place — makes it easy to check and prevent loss of units, and easy to find exactly the tool you want.

A well balanced selection of 39 matched units:

(1) Ten midget units for ignition and carburetor work — sliding Bar, Tee and 8 Sockets (¼" to 7/16" openings).

(2) Eighteen Master Units for general purpose repairs — Reversible Ratchet, Speeder, Nut Spinner, Universal Joint, 2 Extension Bars and 10 straight-walled Hexagon Socket 7/16" to 1" openings for easy work in close places.

(3) Ten powerful Heavy Duty Units for those larger tougher jobs — Sliding Bar, Extension Bar and 8 Hexagon Sockets from 1-1/16" to 1⅝" openings.

"Keep going with Snap-on Tools" . . . over 1600 in our FREE 120-page catalog. Snap-on builds a complete line of hand tools — available through its own distributing warehouses located in 37 principal cities. See Snap-on Tools in your phone directory or mail coupon below.

No. L-72-N Heavy Duty Reversible Ratchet. Power and leverage for turning large bolts and nuts . . . 24½" leverage

SNAP-ON TOOLS, INC., Kenosha, Wis.

478 Service Salesmen — 37 Branch Warehouse Stocks

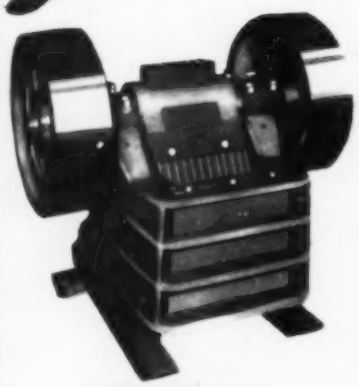
Snap-on Tools, Inc.
Kenosha, Wis.
Without obligation
☐ Have representative call and demonstrate.
☐ Specially interested in .....
☐ Free catalog, please.
Name .....
Firm .....
Address CM-3

ROGERS JOPLIN

The sign of . . .

Dependability

Our users will tell you about



CRUSHER
sizes — 6" to 36"

The Heavy Rigid Beds

The Big Shafts

The Long Bearings

The Perfect Running Balance

The Simplicity of Replacing Wearing Parts

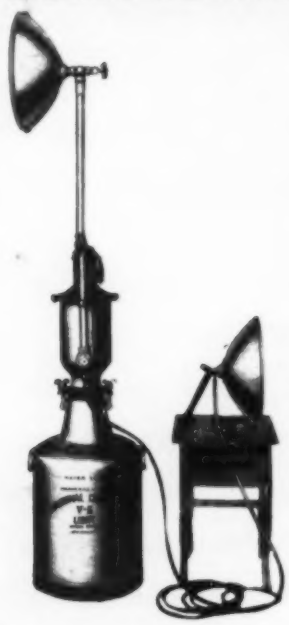
The Unmatched Capacity

In fact ***more Crusher for your Dollar***

ROGERS IRON WORKS CO.
JOPLIN • MISSOURI

NATIONAL CARBIDE

V-G LIGHTS



National Carbide V.G. Light. 8,000 Candle Power without extension; 16,000 Candle Power using extension. Easily handled by one man.

MORE LIGHT FOR LESS MONEY

Easily Handled
No Wires
No Carbide Wasted
No harm done if tipped over

Y 139 National Carbide V. G Handy Light 1500 Candle Power Weighs only 37 pounds charged.

Write for COMPLETE INFORMATION

W11-C1 National Carbide Lantern. Brilliant rear signal of red blue or green. Ideal for emergencies

Use National Carbide in the Red Drum

NATIONAL CARBIDE CORP.
LINCOLN BUILDING NEW YORK

You make good plans for the job

. . . you carry them out more effectively with J & L Steel construction products . . . J & L fabricated structural work . . . J & L dependable delivery.

Your plans are well laid for completion . . . on schedule . . . at a profit. To carry them out effectively you must have steel on the job when you need it . . . steel that gives you fast, economical installation and erection. In this Jones & Laughlin helps you.

J&L construction materials are made exactly to specifications. You can depend on them to meet your requirements for quality, strength and durability . . . for, back of every J&L construction product is the knowledge gained by Jones & Laughlin through 87 years of manufacturing high quality iron and steel products.

With J&L fabricated structural work, you get speedy, economical erection. All members fit perfectly on the job . . . a result of the extra care and precaution taken at the shop to make sure rivet holes match . . . that connections do not bind . . . that end to end dimensions are correct. J&L operates three well equipped fabricating shops . . . at New York, Pittsburgh, New Orleans . . . to give you fast, dependable service.

Engineers and contractors throughout the country have long profited by relying on J&L for their steel construction products and fabricated structural work. You, too, will find that the job moves steadily forward . . . that you save time and money when you specify J&L.

Look to J & L For Your Steel Requirements

Seamless and Welded Steel Pipe —Piling—Plates—Structural Shapes—Junior Beams—Lightweight Channels—Bars for Concrete Reinforcement—Tie Wire —Assembled Road Bar Mats—Fabricated Structural Work—Steel Plate Construction—Nails —Spikes—Wire Products.

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH, PENNSYLVANIA

but that's not all you gain by

CALCIUM CHLORIDE curing of Concrete

THE fact that two pounds of Calcium Chloride with every bag of Standard Portland cement more than doubles one-day strength is now verified by the U. S. Bureau of Standards. You get the increased strength when you need it, for quicker pavement opening, earlier removal of forms (for other jobs), safe, quick handling and shipping of blocks and other products.

In addition to high early strength you get:
Lowered volume changes reduce cracking and crazing.
A more plastic mix which fills forms better.
You get a smoother finish, and do it easier.
Finishing may follow pouring in shorter order.
You can use lower water ratios with resulting greater strength.

On top of all these, you get better concrete always, in all ways, higher ultimate strength, a sounder job all through.

Write any of the firms below for literature on Calcium Chloride in concrete.

CALCIUM CHLORIDE ASSOCIATION

The Dow Chemical Company.....Midland, Michigan
Michigan Alkali Company.....60 E. 42nd St., New York City
Solvay Sales Corporation.....40 Rector Street, New York City
The Columbia Alkali Corporation.....Barberton, Ohio

CALCIUM CHLORIDE
YEAR 'ROUND CONCRETE CONSTRUCTION

Step-by-Step

Handling Forms

By ADOLPH J. ACKERMAN

Step-by-Step Field Methods

Raised-Edge Curb for Concrete Pavement

Building Wreckers Develop

"Upside-Down" Method

of Orderly Demolition

HYDRAULIC BORING MACHINE

Installs Telephone Conduits Under Main-Line Tracks of Railroad

Portable Repair Units Cut Costs of

Asphalt Cold Patches

PUMPED CONCRETE

Cuts Cost of Floors and Roof of Five-Story Albany Post Office

STIFF-LEG DERRICKS

Handle Materials for

How to Increase Efficiency at the

BATCHING PLANT

From a report by ANDREW P. ANDERSON Highway Engineer, Division of Materials

Planning and Planting

Medium-Sized Jobs

By J. B. BURGHARDT,
Formerly Construction Superintendent for J. R. Hampson & Co., Inc.

HOW

. . .

The reading pages show you "HOW"—

The advertising pages show you "WHAT WITH"—

— a service combination hard to beat.

. . .

See page 3 for "HOW" items in the editorial pages.

See pages 115 and 116 for "WHAT WITH" items made by manufacturers whose advertisements appear in this issue.

If you do not find what you are looking for —

Write

Construction Methods and Equipment
Information Bureau
330 West 42nd St., New York City

DIMENSIONS *must be Accurate!*

AMERICAN TIGER BRAND WIRE ROPE

LIKE any complicated machine*, American Tiger Brand Wire Rope is precision-built. Dimensions must be accurate to insure the smooth working together of the many wires so they will handle your jobs efficiently.

Think how much you demand of wire rope—it must string or reeve easily and quickly . . . spool well . . . avoid whipping at high speeds . . . stand up under the terrific jerks of starting and stopping.

That is the kind of service you can expect from American Tiger Brand Wire Rope. It is the product of engineers who have specialized for years in its design and it is backed by more than 100 years of wire making experience.

American Tiger Brand Wire Rope is available in either Standard (non-preformed) or Excellay (preformed) constructions.

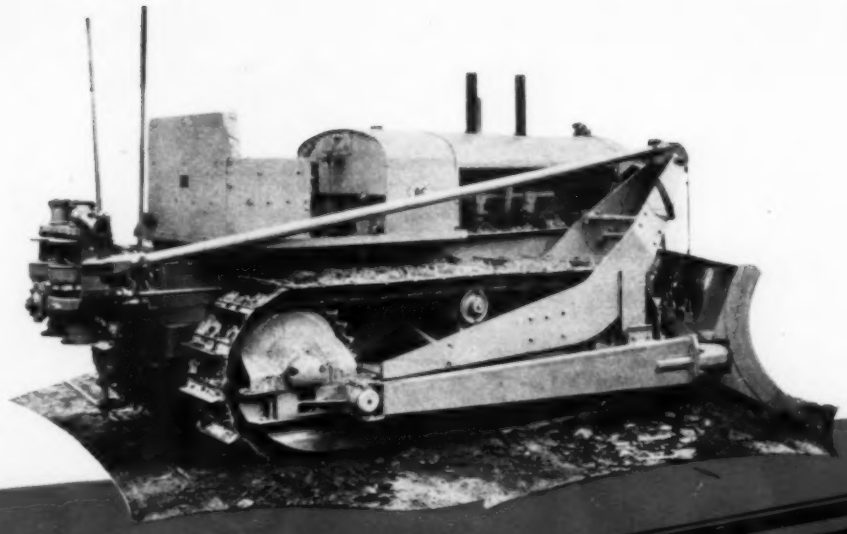
- American Tiger Brand Wire Rope
- Electrical Wires & Cables
- Amerclad All-Rubber Cables
- Aerial Tramways
- Tiger Wire Rope Slings
- Tiger Wire Rope Clips

*American Tiger Brand Wire Rope is a machine, more complicated than many, fitting the definition "Any combination of mechanism for utilizing or applying power."

AMERICAN STEEL & WIRE COMPANY
208 South La Salle Street, Chicago · Empire State Building, New York
COLUMBIA STEEL COMPANY
Russ Building, San Francisco
United States Steel Products Company, New York. *Export Distributors*

USS

UNITED STATES STEEL



Emsco "A-C" Model Trailbuilder equipped with Emsco Double-Drum Power Control Unit. Emsco patented tilting feature permits tilting blade for casting to either side more quickly than any similar device; or it can be used in conventional bulldozing position. Descriptive bulletin supplied on request.

EMSCO POWER CONTROL UNITS

SINGLE AND DOUBLE DRUM TYPES

Due to their rugged construction, compact design, light weight per pound of line pull, and other engineered improvements, Emsco Power Control Units are setting new standards of fast, efficient and economical performance for all types of dirt moving equipment. Note these outstanding features:

- *—Proper mounting to the tractor.*
- *—Logical position of the drums.*
- *—Direct pull on the bare drums, increasing possible pounds pull.*
- *—Instant and easy engaging and release of the clutch.*
- *—Large brakes to hold any load it can lift.*
- *—Swinging "fair-head," to operate at any angle, assuring even wrapping of the cable.*
- *—Tension shoe, against working cable, to prevent loose ends and resulting "kinks."*
- *—Oversize bearing to assure long continuous operation.*
- *—Oil seals at every point necessary to keep oil from clutch facings.*

EMSCO
Cable and Hydraulic
TRACTOR EQUIPMENT

A Complete Line of Cable and Hydraulic Controlled Tractor Equipment

Bulldozers
Trailbuilders
Rippers - Scrapers
Power Control Units

EMSCO

EMSCO DERRICK & EQUIPMENT COMPANY

TRACTOR EQUIPMENT DIVISION

General Offices and Plant: 6701-7101 South Alameda Street, Los Angeles, California

Eastern Sales Office: 332 South Michigan Avenue, Chicago, Illinois

HOW TRUCKS RUSHED FOOD TO STRICKEN FLOOD AREA

. . . Trucks Loaded in Double-Quick Time . . .

By LOWELL THOMAS

"Famine threatened. Flood-made lakes covered homes, stores, restaurants. Hundreds of thousands of homeless fled the mad Ohio River. By phone, wire and radio came frantic appeals for aid.

"To supply food to dozens of Indiana, Ohio and Kentucky cities the Chas. Sucher Packing Company of Dayton kept its fleet of 34 trucks running 24 hours a day. It was load up and drive, load up and drive with not a minute to waste. Through driving rainstorms and blinding sleet the trucks fought their way. Tires found a footing on roads half washed away. There was a terrific strain on driver, truck and tires. "Believe me, it's in times such as this when human lives are at stake that freedom from tire trouble is really appreciated." These trucks all roll on Goodrich Triple Protected Silvertowns. And Silvertowns carried them through the emergency without a single tire delay.

* * *

Lowell Thomas's story is typical of truckers' experience with Goodrich Silvertowns. For the big loads, on the hard hauls,

. . . Ten Tons of Meat Ready to Roll . . .

where minutes count — you usually find Silvertowns. It's because of a special construction—Triple Protection—that checks 80% of all premature failures. This development means greater freedom from side-wall breaks and blow-outs, increased mileage, lower repair bills. Money saved.

Here's why. All Silvertowns for trucks have this extra protection built into the heart of the tire:

1 **PLYFLEX** — distributes stresses throughout the tire — prevents ply separation—checks local weakness.

2 **PLY-LOCK**—protects the tire from breaks caused by short plies tearing loose above the bead.

3 **100% FULL-FLOATING CORD**—eliminates cross cords from *all* plies — reduces heat in the tire 12%.

NO EXTRA COST

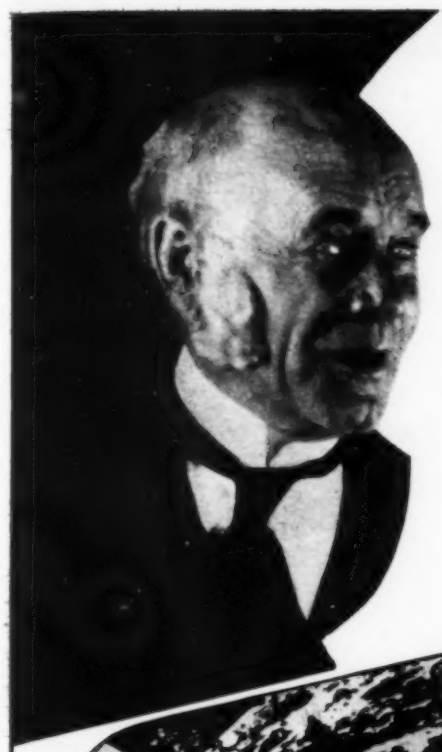
There's the tire you should have for *your* trucks — whether you haul lumber, dirt, laundry or milk. It will save you real money. Naturally, it costs more to build a tire with Triple Protection. But it costs you nothing extra. Ask any Goodrich dealer for prices.

Read What Mr. Sucher Says

Charles F. Sucher, President of the Chas. Sucher Packing Co., says, "We find that Triple Protection does everything that is claimed for it. We have not had a single premature failure with Goodrich Silvertowns. For nine months our total tire repair bill for 34 trucks was only $65.75."

Goodrich *Triple Protected* **Silvertowns**

SPECIFY THESE NEW SILVERTOWN TIRES FOR TRUCKS AND BUSES

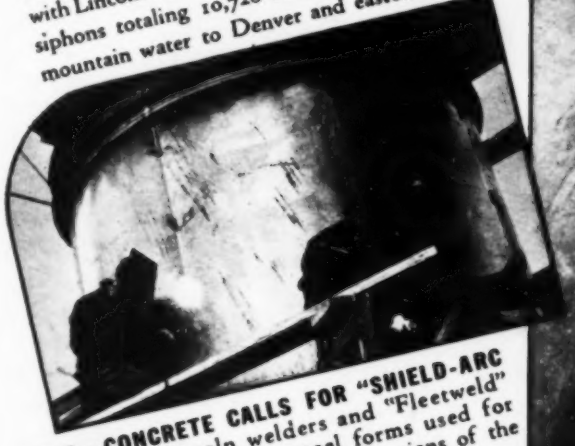


"YOU KNOW, LAD, IN NOAH'S TIME IT WAS THE ARK.—TODAY THEY'RE SOLVING WATER PROBLEMS WITH THE ARC."

"I'M WITH YOU, POP. AND JUST A FEW YEARS AGO, JOBS LIKE THESE WOULD HAVE BEEN JONAHS.—WHAT A WHALE OF A DIFFERENCE 'SHIELD-ARC' WELDING HAS MADE IN DESIGNS, SCHEDULES AND COSTS!"

2,436,000 LBS. OF STEEL PLATE—fabricated entirely with Lincoln welders and electrodes form seven huge siphons totaling 10,728 lineal ft. They will carry mountain water to Denver and eastern Colorado

DEPENDABLE "FLEETWELD"—You'll find it on the majority of the jobs. It's used on this 55,000 ft. Crystal Springs branch of the Hetch Hetchy project.



HERE—CONCRETE CALLS FOR "SHIELD-ARC WELDING"—Lincoln welders and "Fleetweld" electrodes fabricate the steel forms used for casting the 44-ton concrete pipe sections of the 200-mile Colorado River Aqueduct.

"DOWN EAST" ON A 62" LINE—You'll find "*Shield-Arcs*" the country over on water line jobs. They're used exclusively on the new 1600 ft penstock job of the Walsh Holyoke Steam Boiler Works, up in Mass.

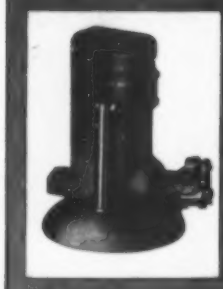
THE LINCOLN ELECTRIC COMPANY
DEPT. G-352, CLEVELAND, OHIO

Largest Manufacturers of Arc Welding Equipment in the World

LINCOLN
SHIELD-ARC WELDING

DUFF-NORTON

Standard or Special Lifting JACKS *for every purpose*



WHETHER the job calls for lifting or lowering . . . pushing or pulling . . . holding or moving—you will find in the Duff-Norton Line of Jacks, a type and capacity to meet every requirement from one to one-hundred tons or more.

Duff-Norton Jacks are the product of more than 50 years of specialization . . . used and preferred the world over in railroad construction, bridge building, excavating, mining, oil well operations, telephone cable work and automobile and truck repair.

Outstanding quality, strength, simplicity, safety, ease of operation and long life are general features of Duff-Norton jack design that have established Duff-Norton as the world's oldest and largest manufacturers of lifting jacks—sold and recommended by Mill and Mine Supply dealers and jobbers everywhere.

SPECIFY DUFF-NORTON AND GET THE BEST!

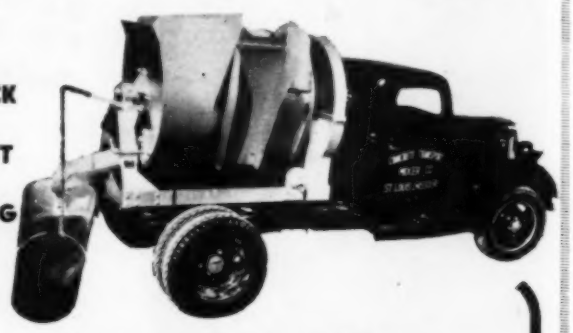
LISTEN IN
Every Friday Nite at 7:45 P.M., E.S.T.
"The House That Jacks Built"
RADIO PROGRAM
WEAF, New York; WMAQ, Chicago; KDKA, Pittsburgh
Entertainment that Construction Engineers Like!

THE DUFF-NORTON MANUFACTURING CO.
PITTSBURGH, PA.
Branch Offices in Principal Cities

"THE HOUSE THAT JACKS BUILT"

The mixer for maximum *profits*... *on large and small jobs*

FOR ANY TRUCK
●
LOW FIRST AND OPERATING COST



Concrete **TRANSPORT** Mixer

FEATURES

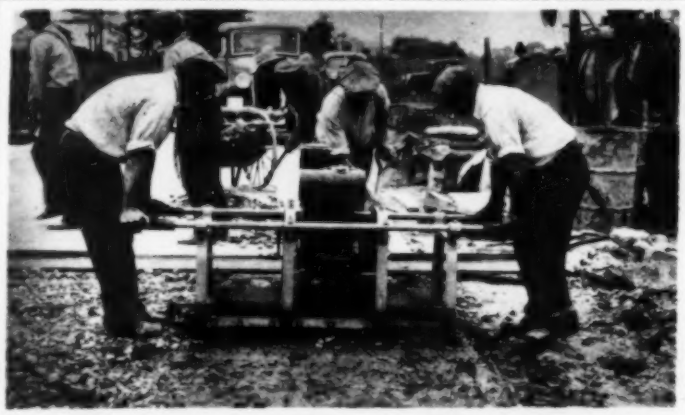
Mountable on any truck. All steel construction. Light weight. Few moving parts. Oversize capacity. Simple. Rugged. Capacities Mixers 1 and 1½ cu. yds. Agitators—1½ and 2 cu.yds. Will cut cost per cubic yard .35 to .75 cents. Investigate!

Side and rear discharge

Open top for easy charging and control and inspection. Ball bearing power take-off. Revolving blades operated from truck motor — one to 20 r.p.m. Thorough mix. Side and rear discharge. Handles asphalt and road oils. The result of 10 years experience in this field.

Send for complete details — for more profits on your next job.

CONCRETE TRANSPORT MIXER CO.
650 Rosedale St., St. Louis, Mo.



VIBRATED
ROAD PATCH REPAIR
(all concrete)

AT LAST . . . An ideal, *all concrete*, road patch that can be opened to traffic three hours after completion. This is made possible by a patented method of applying high frequency vibrations—The International Way—to old broken concrete bonded together with very stiff mixes of sand and cement grout.—No more red lights or barricaded sections of road during the patching season—

● BETTER
● CHEAPER and
● FASTER PATCHES

for repairing concrete roads. This proven method is also applicable to road widening with the least possible interference to traffic. Full details of costs, strength and charge for rental of complete equipment, on a trial basis, sent upon request.

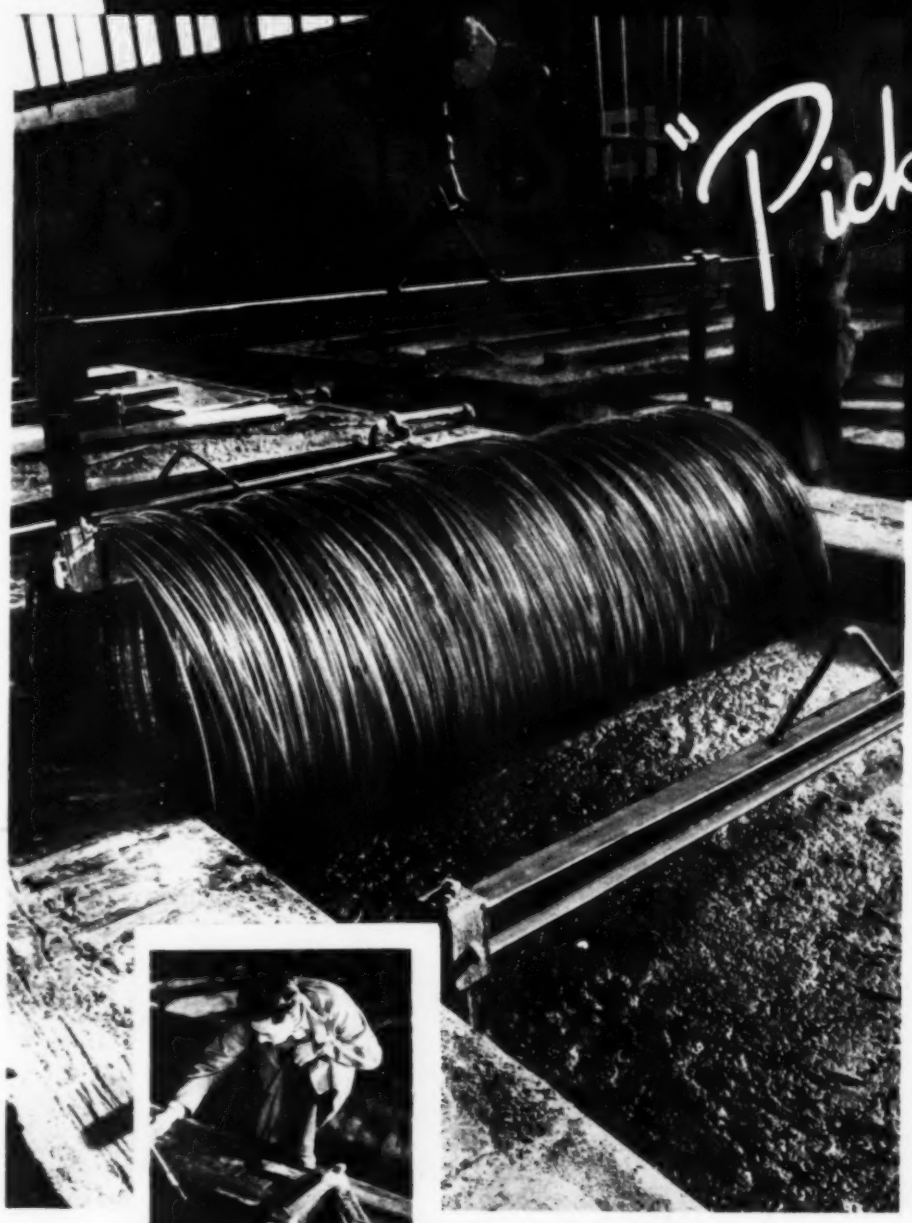
THE INTERNATIONAL VIBRATION COMPANY
SUBSIDIARY — THE INTERNATIONAL STEEL TIE COMPANY
CLEVELAND, OHIO


THE 1937
CEDAR RAPIDS
PROFIT MAKERS
Heading the list of ... for 1937 are the Straight Line Portable Rock and Gravel Plants. The
Super Tandem ... right hand picture. The Junior Tandem Type is shown immediately above.
Other Iowa Profitmakers
Asphalt Mixing Plants (Hot or Cold Mix)
Traveling Road Mix and Rapidmix Plants
Portable Quarry Plants
Washing Plants
Tractor-Crusher Roadside Plants
Belt Conveyors — Screens — Bins — Bucket Elevators
Portable Placer Machines
Gravel Stabilizer Plants
A Complete Line of Portable and Stationary Material Handling Equipment
These are the Profitmakers for 1937
CHANGE TO IOWA
$ FOR PROFIT $
Cedar Rapids Portable Rock and Gravel Plants lead the field ... profits for their operators. They are
Profitmakers because they give greater capacity ... Change to Iowa for Profits. Write for bulletins.
IOWA MANUFACTURING COMPANY
CEDAR RAPIDS, IOWA, U. S. A.

MACWHYTE

PRE *formed* WIRE ROPE

INTERNALLY LUBRICATED



"Pickling"...

an important step in the making of tough, strong wire rope

● All the wire used in Macwhyte PREformed Wire Rope is made in our own wire mill. Careful attention is given to every step in the processing of this wire. High quality—not heavy tonnage—is the aim of our wire specialists. The "pickling" operation you see pictured here is extremely important. Immersing the wire as it comes from the heat treating furnaces in these acid baths removes impurities which might cause premature failure of the finished rope. Strict control assures the greatest uniformity in each coil of wire. This is one of the many reasons why Macwhyte PREformed Wire Rope gives such good service.

NO. 299-C

Twice a day this experienced Macwhyte chemist tests the acid bath to assure uniform "pickling."

● Monarch WHYTE STRAND PREformed Wire Rope . . . specially designed for jobs where ropes must stand up under severe bending. Macwhyte manufactures special constructions for shovels, draglines, cableway excavators, scrapers, loaders, mixers, pavers, incline hoists. Macwhyte also makes specially designed non-preformed wire ropes.

MACWHYTE COMPANY, *Kenosha, Wisconsin*

Manufacturers of wire rope and braided wire rope slings
Distributors and stock throughout the U. S. A. for quick service

BIGGER LOADS FASTER SCHEDULES ... should interest you

Gar Wood Scrapers get full capacity loads, as this photograph shows. Note that the dirt is overflowing the bowl.

Four sizes: 6 — 8 — 10 — 12 cu. yds. are available.

Gar Wood Trailbuilders have both angle and bulldozing blade. Hydraulically controlled.

Gar Wood Bulldozers are unusually rugged and well-designed to save tractor from abuse.

Gar Wood Rippers have adjustable depth control and self cleaning standards. 3 models available.

No matter what the soil materials . . . light sand, compacted clays, adobes, shale or loose rock . . . Gar Wood Scrapers will move more of it . . . faster! Dependable Hydraulic Control gives one man full command for loading, carrying, dumping and spreading. He can apply power in a flash, when and where needed. The wheelbase can be shortened, when carrying, to improve maneuverability. "Cut-under" front truck permits sharper turns. The draft line, when loading, is straight from tractor to bowl. Three point suspension eliminates twisting stresses. Option of four models provides a machine best suited to particular needs. There is *real economy* in Gar Wood Scrapers. *Ask any Owner!*

ROAD MACHINERY DIVISION
GAR WOOD INDUSTRIES, Inc.
DETROIT, MICHIGAN

Beginning of dump and spreading operation. Compare the wheelbase with the one in photograph below. Operator can change wheelbase to suit conditions.

Built with 3-point suspension, the Gar Wood Scraper can follow anywhere the tractor leads.

SCRAPERS
TRAILBUILDERS
BULLDOZERS

GAR WOOD

SERVICE Construction Methods and Equipment SECTION

SEARCHLIGHT SECTION

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BUSINESS : : OPPORTUNITIES

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Positions Vacant and all other classifications, 10 cents a word, minimum charge $2.00

Positions Wanted (full or part-time salaried employment only) ½ the above rates, payable in advance.

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1 inch	$6.00
2 and 3 inches	5.75 an inch
4 to 7 inches	5.50 an inch

Other space and contract rates on request.
An advertising inch is measured vertically on one column, 3 columns—36 inches to a page.

YOU ARE ONE

of 20,000 readers of CONSTRUCTION METHODS and EQUIPMENT.

Your problems of field operations associated with building and engineering construction—business or individual—are duplicated with *other* readers BUT—

Still *OTHER* readers can provide the solution of your problem if they *know what it is!*

Tell them! Here! Through classified advertising in the Searchlight Section of *your* business paper and *theirs.*

EQUIPMENT and MATERIALS

An index of products made by manufacturers whose advertisements appear in this issue of CONSTRUCTION Methods and Equipment.

If you do not find all you need in the advertising section, we shall be glad to assist you. Write to—

CONSTRUCTION Methods and Equipment
Information Bureau
330 West 42nd St. New York City

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Barber-Greene Co.

ASPHALT
Texas Company

ASPHALT PLANTS
Blaw-Knox Company
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BACK FILLERS
Harnischfeger Corp.
Link Belt Co.
Northwest Engineering Co.

BARGES, CONCRETE AND STEEL
Jones & Laughlin Steel Corp.

BARS, IRON AND STEEL
Inland Steel Co.
Jones & Laughlin Steel Corp.

BATCHERS, ADJUSTABLE MEASURING
Blaw-Knox Company
Heltzel Steel Form & Iron Co.

BELTING
Goodall Rubber Co.
Goodrich Rubber Co., B. F.

BINS, STORAGE
Blaw-Knox Company
Chain Belt Company
Heltzel Steel Form & Iron Co.

BLASTING, ACCESSORIES
Atlas Powder Co.
Ensign-Bickford Co.

BODIES, MOTOR TRUCK
Gar Wood Industries, Inc.

BOLTS, NAILS, NUTS, RIVETS and SPIKES
Inland Steel Co.
International Nickel Co., Inc., The

BOLTS, RIB
Automatic Nut Co., Inc.

BOOKS, ENGINEERING
McGraw-Hill Book Co.

BOOTS, RUBBER
Goodall Rubber Co.

BUCKETS
Blaw-Knox Company
Bucyrus-Erie Co.
Haiss Mfg. Co., George
Harnischfeger Corp.
Insley Mfg. Corp.
Northwest Engineering Co.
Owen Bucket Co.
Page Engineering Co.
Wellman Engineering Co.

BUILDINGS, STEEL
Blaw-Knox Company

BULLDOZERS
Baker Mfg. Co.
Emsco Derrick & Equip. Co.
Gar Wood Industries, Inc.
La Plant Choate Mfg. Co.
Le Tourneau, Inc., R. G.

CABLEWAYS
American Steel & Wire Co.
(U. S. Steel Corp. Subsidiary)
Roebling Son's Co., J. A.

CABLE, ELECTRIC
Roebling Son's Co., J. A.

CALCIUM CHLORIDE
Calcium Chloride Assoc.

CARBIDE
National Carbide Corp.

CASTINGS, IRON & STEEL (alloy)
International Nickel Co., Inc., The

CEMENT
Lehigh Portland Cement Co.
Lone Star Cement Corp.
Portland Cement Ass'n.
Universal Atlas Cement Co.
(U. S. Steel Corp. Subsidiary)

CEMENT (BULK) HANDLING EQUIP.
Barber-Greene Co.
Blaw-Knox Company
Chain Belt Company
Heltzel Steel Form & Iron Co.

CHAIN STEEL & MALLEABLE SPROCKET
Chain Belt Company
Link Belt Co.

CHUTES, CONCRETE
Insley Mfg. Corp.
Ransome Concrete Machry. Co.

COMPRESSORS, AIR
Allis-Chalmers Mfg. Co.
Novo Engine Co.
Schramm, Inc.

CONCRETE CURING MATERIAL
Calcium Chloride Assoc.

CONCRETE REINFORCEMENT
American Steel & Wire Co.
(U. S. Steel Corp. Subsidiary)
Inland Steel Co.
Jones & Laughlin Steel Corp.
Wickwire Spencer Steel Co.

CONCRETE SLAB RAISING EQUIPMENT
Koehring Company

CONVEYING & STORAGE SYSTEMS
Barber-Greene Co.
Chain Belt Company
Link Belt Co.
Portable Machry. Co.
Wellman Engineering Co.

CONVEYORS, BELT, BUCKET & CHAIN
Barber-Greene Co.
Chain Belt Company
Haiss Mfg. Co., George
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Portable Machry. Co.
Wickwire Spencer Steel Co.

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Austin-Western Road Machry. Co.
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Koehring Company
Link Belt Co.
Michigan Power Shovel Co.
Northwest Engr. Co.
Thew Shovel Co.
Universal Crane Co.

CRANES, MOTOR TRUCK
Thew Shovel Co.
Universal Crane Co.

CRUSHERS & PULVERIZERS
Acme Road Mchry. Co.
Allis-Chalmers Mfg. Co.
Galion Iron Works & Mfg. Co.
Iowa Mfg. Co.
Rogers Iron Works Co.
Universal Road Machry. Co.

CULVERTS
Armco Culvert Mfrs. Ass'n.

CUTTING TOOLS, PORTABLE HAND
Porter Co., H. K.

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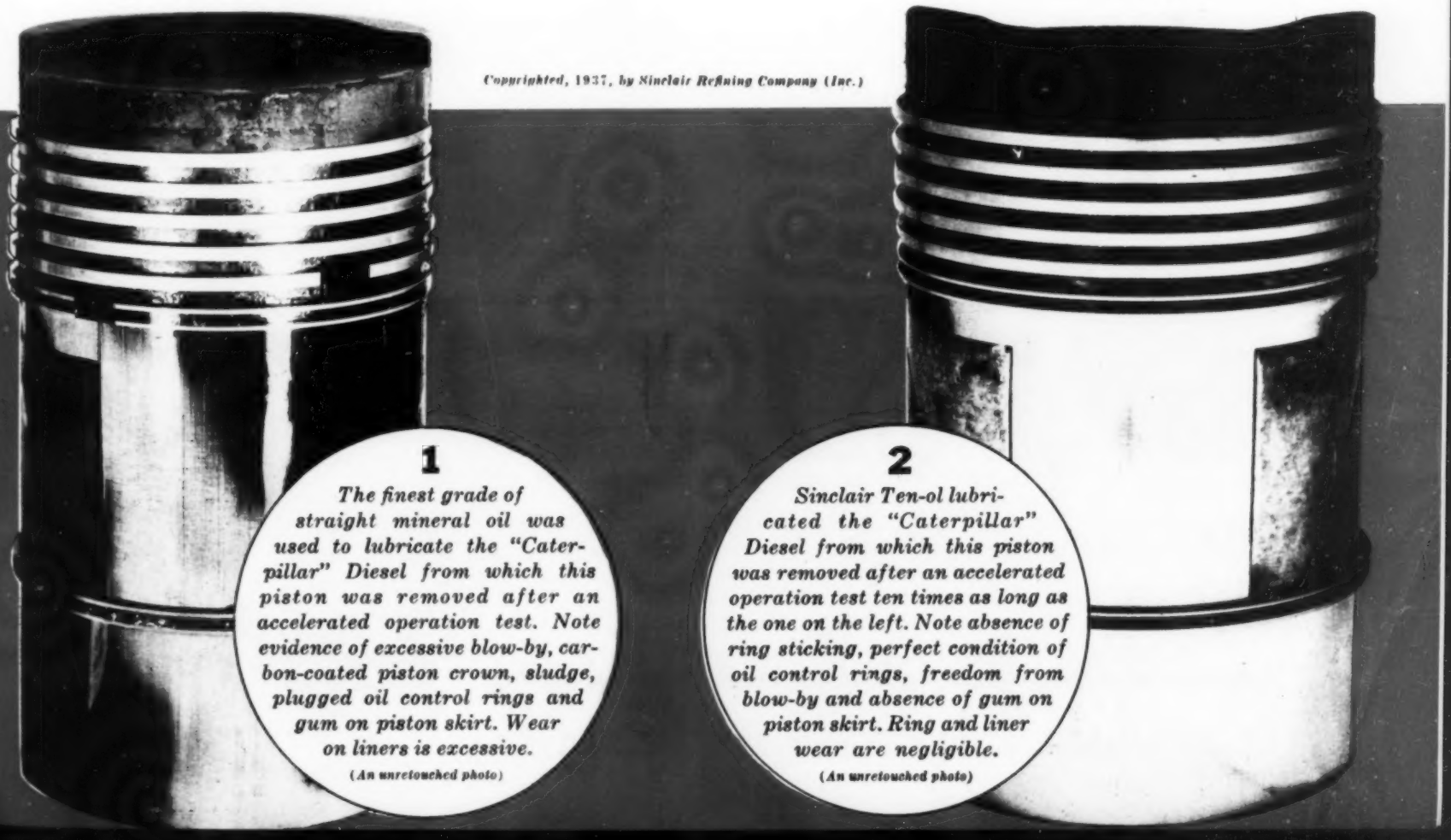

1

The finest grade of straight mineral oil was used to lubricate the "Caterpillar" Diesel from which this piston was removed after an accelerated operation test. Note evidence of excessive blow-by, carbon-coated piston crown, sludge, plugged oil control rings and gum on piston skirt. Wear on liners is excessive.

(An unretouched photo)

2

Sinclair Ten-ol lubricated the "Caterpillar" Diesel from which this piston was removed after an accelerated operation test ten times as long as the one on the left. Note absence of ring sticking, perfect condition of oil control rings, freedom from blow-by and absence of gum on piston skirt. Ring and liner wear are negligible.

(An unretouched photo)

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